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COMMERCIAL FISHERIES ABSTRACTS

U. S. DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF COMMERCIAL FISHERIES





UNITED STATES DEPARTMENT OF THE INTERIOR

FISH AND WILDLIFE SERVICE

BUREAU OF COMMERCIAL FISHERIES

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FINDING AND REDUCING NOISE

0.12

(*)
Nieuwenhuizen, J. K. (Bataafse Internationale Petroleum, Maatschappij NV, The Hague, The Netherlands), and C. W. N. Veerling
New Scientist 37, No. 590, 698-699 (March 28, 1968)

A parabolic mirror of the type once used to detect planes was used to locate noisy equipment at an oil refinery. The mirror has a focal distance of 0.7 meters; it focuses sound waves onto a dynamic microphone wired to earphones that are worn by the investigator. The mirror was placed at various points outside the refinery at a distance of about 2.5 kilometers. If the frequency were above 100 Hz, the noise source could be located within a very small angle from where the mirror was situated. By repeating this operation from various sites, the noise source in the refinery could be pinpointed to an area of a few square meters. Once a noisy machine was located, a combination microphone-amplifier-earphone was placed on it to ascertain to an accuracy of a few centimeters which part of a pipe, valve, bearing, or motor produced the noise.

The investigators found that control valves, pipes, screw compressors, and the steel foundations of electric motors were the principal contributors to noise. The noise from the screw compressors originated from the piping, including the inlet silencer. Insulating the last few meters of inlet and outlet piping and of the piping between pumping stages reduced the noise output by as much as 20 decibels or more. Partly filling the steel support box of the electric motors with mineral wool substantially reduced the noise level also.

*Items on back of card.

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UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

ABSTRACTER: M. F. Tripple

0.5 CORRELATION OF TAXONOMIC CRITERIA FOR A COLLECTION OF MARINE BACTERIA

Johnson, Roy M. (Botany Department, Arizona State University, Tempe 85281), Mary E. Kataraki (Department of Microbiology, University of California at Los Angeles), and William P. Weisrock
Applied Microbiology 16, No. 5, 708-713 (May 1968)

A total of 208 bacteria were isolated from sea water, marine mud, fish, shark, and an island in the Indian Ocean. Attempts by the authors to classify to genera the gram-negative isolates from these bacteria produced conflicting results. Accordingly, the isolates were characterized generically by minimal tests employing currently accepted major criteria. A numerical taxonomy study was subsequently done on the bacteria to determine the validity of the generic criteria and to provide another approach to classification. The authors felt that when numerical taxonomy is properly used, it can be an excellent tool to investigate possible correlations between taxonomic criteria of established taxonomic groups.

The percent of similarity was computed according to the method of Sneath (1957): $\text{Percent } S = \text{Nsp}/(\text{Nsp} + \text{Nd}) \times 100$ where percent S is similarity coefficient, Nsp is number of similar positive matches, and Nd is the number of dissimilar matches. Grouping of values was done with the method of single-linkage clustering after inspection of individual strain values. The 60-percent level of similarity was used for grouping because there were only a few strains above the 80-percent level and there was virtually a continuum at the 50-percent level.

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ABSTRACTER: M. F. Tripple

LOCATING AND REDUCING NOISE IN FACTORIES

TAXONOMIC CRITERIA FOR MARINE BACTERIA

DEVELOPMENT OF DENMARK'S CHIEF FISHING PORT

KOREAN INSPECTION STANDARDS FOR FISHERY PRODUCTS

1.0142

(*)
Anonymous
World Fishing 17, No. 5, 38-39 (May 1968)

Esbjerg, Denmark's leading fishing port, has facilities for over 550 fishing vessels. The port is divided into north and south sections by a central quay. The southern group of basins is devoted to the handling of vessels supplying fish for human consumption. A fish auction hall and marketing area occupy most of the space. The northern group serves vessels landing catches for industrial use. A cooperative fish-meal and -oil plant and two other factories are supplied from vessels that lie alongside mechanical discharge units on the quays surrounding the basins. A slipway in the northern part accepts vessels of up to 750 tons deadweight and has berths for 34 vessels of the Danish-seiner type. Along the berths are sheds for the repairing and construction of vessels under cover.

The fish auction hall in the southern half covers about 9,500 square yards with offices at either end for port and market officials. The entire market area can be divided into three sections. The first section is the 285-yd.-long quay that will accept 18 fishing vessels up to 66 feet overall length. The fish in ice are tipped onto a conveyor belt that carries the fish into the auction hall via small thoroughways in the main doors. The fish pass over a grid, and the ice falls onto a second conveyor belt that returns the ice to the basin. Inside the hall, the fish are carried by conveyors to bins for sorting and boxing. In the second section, empty boxes are stacked five deep. When the boxes are filled with fish for sale, they are arranged in auction squares no more than two layers deep.

*Item on back of card.

COMMERCIAL FISHERIES ABSTRACTS VOL 22 NO 1 PAGE 1
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

ABSTRACTER: M. F. Tripple

1.0155 KOREAN INSPECTION LAWS OF FISHERY PRODUCTS

(*)

Anonymous
Inspection Service Series No. 1, 13 pp. (1967) (Central Fisheries Inspection Station, Seoul, Korea)

The export of fishery products from the Republic of Korea plays an important role in the total export industry. In 1966, fishery exports amounted to \$9,193 thousand dollars, which is nine times higher than in 1957. With the increase in exportation of Korean fishery products, more foreign traders are dealing with Korea. The series of five Inspection Service Bulletins was published to introduce the Korean fishery products inspection system and standards to foreign traders and distributors.

Series No. 1--A guide for foreign traders and distributors. This pamphlet covers the development of the inspection program, the inspection system, the organization and function of the inspection stations, the inspection law, and the government laws concerning fishery products inspection.

Series No. 2--Korean inspection standards for frozen fishery products. The major content of this pamphlet is the frozen fish products inspection standards, which cover plant facilities, conditions for freezing and storing products, quality and grade standards, packaging and labeling, and inspection methods and marks. The inspection regulations for frozen fish products are included, as is a list of freezing plants licensed to export.

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UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

ABSTRACTER: M. F. Tripple

0.12 SMOKING AND CURING FISH

British Patent 1,105,490
Food Science Abstracts 2, No. 6, Abstract No. 68/731, p. 262 (June 1968)

A plant used for smoking fish is described with diagrams. The fish pass on trolleys through a series of four curling towers.

FISH PROCESSING EQUIPMENT

Food Manufacture 43, No. 5, 51-54 (May 1968)

Machinery for the handling of rawfish and the preparation of fish products is described in this article. Machines for the following processes are mentioned: breaking and mincing; continuous batter enrobing and frying; blanching; distillategrating, and pumping; smoking, comminuting, ball forming, and stick making; pulverizing; conveying; fillet portioning; and block and herring filleting [Abstracter: M. F. Trippe]

the base ratios reported for their genus than to each other as well as the converse.

Measures can be taken at the design stage to limit the output of noise from a plant. The most obvious measure is to provide better soundproofing. The plant layout can be modified so that noisy equipment is screened by equipment that is less noisy. Acoustic shields can always be installed between the noise sources and outside areas, and silencers can be placed on all suction and discharge piping.

Studies of nucleic-acid base ratio on a typical *Vibrio* species from each group and on other genera were performed. The phenotypically different *Vibrio* sp. had a narrow range of base ratios; the other genera had base ratios more similar to the base ratios reported for their genus than to each other as marine bacteria. (21 references)

monas, *Achromobacter*, *Flavobacterium*, Group 8 (*Achromobacter*, *Flavobacterium*, *Vibrio*, *Hyphomicrobium*, *Flavobacterium*) contain strains isolated from marine mud and shows the greatest crossing of similarity between groups. Group 2 (*Brevibacterium*, *Vibrio*) shows a high correlation with a mud habitat. Pigment appears to have little significance in the grouping of bacteria because pigmented forms are found in most groups. Group 7 (*Achromobacter*, *Vibrio*, *Flavobacterium*, Group 8, both of which were isolated primarily from fish intestine, have no pigment, attack glucose, and are essentially either *Vibrio* or *Achromobacter*.

The authors feel that the following points from the above-mentioned characteristics of the numerical groups are significant. The genus *Vibrio* is found in seven of the eight groups; the exception is group 4, the one small Pseudomonas group. Strains isolated from both shark and dry land are associated only with the first three groups, which are predominantly gram-positive. All luminiscent bacteria of genera *Vibrio* or Photobacter are in group 8 (*Vibrio*, Photobacterium, Achromobacter, Flavobacterium). Group 6 (*Achromobacter*, *Alvillimonas*, *Vibrio*, *Ilyophomacillum*, *Flavobacterium*) contains strains isolated from marine mud and shows the greatest crossing of similarity between groups.

A figure is presented showing the sorted and reordered matrix in which eight major groups can be seen. The major criteria used to determine the genera of the collection are summarized in a table, as are the characteristics of each group. At the 60-percent level of similarity, strains of each group are interrelated with at least one other group.

Fuss, Charles M., Jr. (Bureau of Commercial Fisheries Biological Laboratory, St. Petersburg, Florida 33706)
Commercial Fisheries Review 30, No. 6, 36-41 (June 1968) (Separate No. 816)

The Atlantic thread herring (*Opisthonema oglinum* Le Sueur) is a marine fish of the Clupeidae family that ranges from the Gulf of Maine to Brazil and throughout the Gulf of Mexico. Thread herring occur in great numbers off the west coast of Florida, particularly between Tampa Bay and the Florida Keys. The industrial thread herring fishery which began in the St. Petersburg area during the winter of 1958-59, is of great importance because the stock of thread herring is estimated at 1 million tons, there is a demonstrated catch of 5,000 tons in 4 months, the decline of menhaden stocks is continuing, and the demand for animal protein is increasing.

Field sampling by the Bureau of Commercial Fisheries was done with a research vessel equipped with a hydraulic gill-net power block. Monofilament gill nets of various mesh sizes were used to sample deep parts of estuaries and the Gulf. Beach seines and lift nets were used in shallow areas and near obstructions. Sampling was limited to Tampa Bay, the Charlotte Harbor-Pine Island Sound area, and the nearshore Gulf waters between the two estuaries. Samples were also collected from the commercial catch since the fishery begins off Fort Myers. Fishermen cooperated by preserving samples from individual purse-seine catches.

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ABSTRACTER: M. F. Tripple

Ronholt, Lael L. (Bureau of Commercial Fisheries Exploratory Fishing and Gear Research Base, Juneau, Alaska), and Charles R. Hitz (Bureau of Commercial Fisheries Exploratory Fishing and Gear Research Base, Seattle, Washington)
Commercial Fisheries Review 30, No. 7, 42-49 (July 1968) (Separate No. 820)

The primary aim of two exploratory surveys along the coast of Oregon was to locate and delineate concentrations of scallops (*Patinopecten caurinus*). Secondary aims were to (1) obtain information on the catch rates of the 8-foot, New Bedford-type, scallop dredge and to compare its catching efficiency with that of a modified 400-mesh eastern otter trawl; (2) collect biological data on size, distribution, and abundance of scallops; and (3) collect scallops for analysis of meat yield.

Results of 1963 survey.--Of the 72 hauls made at depths of between 30 and 60 fathoms in the southern area, 39 took scallops. The largest catch rates occurred along the 40- and 55-fathom depth contours, where the average catch was 14 and 57 scallops per $\frac{1}{2}$ hour, respectively. In the 72 hauls, 1,325 pounds of fish and shellfish were captured. No scallops or crabs were taken in the middle area. In the northern area scallops were found in 34 of the 44 hauls and were distributed primarily between 40 and 65 fathoms. The catch rates were best at the 50- and 55-fathom-depth contours, where they averaged 289 and 316 scallops per $\frac{1}{2}$ -hour haul, respectively. In the 44 hauls, 3,692 pounds of fish and shellfish were taken.

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ABSTRACTER: M. F. Tripple

Sinoda, Masatosi (Department of Fisheries, Kyoto Univ., Maizuru, Japan)
Bulletin of the Japanese Society of Scientific Fisheries 34, No. 5, 391-394 (May 1968) (In English)

In the Sea of Japan, Zuwai crabs (*Chionoecetes opilio* Fabricius) are of great economical importance to the seine fishery. During the 1966-67 season, about 23.7 tons of male crabs and 2.6 tons of female crabs were caught by one fishing boat using a Danish seine. However, the catch of this species has decreased in the main fishing ground. To maintain the future crab stock in the Sea of Japan, Japanese scientists have proposed programs for the assessments of the crab stock. The present fishery management relies on empirical information. In this report, the author estimates the efficiency of the seining operation for Zuwai crab and the rate of exploitation.

Assuming the commercial crab population is not overly mobile, and that both the natural mortality and growth are negligible during the fishing season, Delury's method is applicable for estimating gear efficiency and population size using catch and effort data. The basic equation is $\frac{Y}{X} = aP_0 - a \int_0^X Y dt$, where Y is the catch in weight per unit time, X is the effort in haul, P_0 is the stock biomass (over)

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Hight, William L. (Bureau of Commercial Fisheries, Exploratory Fishing and Gear Research Base, Seattle, Washington 98102)
Commercial Fisheries Review 30, No. 6, 42-45 (June 1968) (Separate No. 817)

Hydraulic drives.--The original method in which the cable was rewound onto the reel by water resistance on the trawl as it was set over the stern has largely been replaced by hydraulic power sources.

Groundline flanges.--To eliminate the need for winding groundlines level by hand, a second flange has been added about 12 inches inside each end flange. Groundlines are wound within this restricted area and do not have to be closely watched. As the net reaches the reel, the groundlines are pushed through a notch on the inside flange, and the net is wound on the center part of the reel. The flange is securely bolted around the core and can be easily removed or adjusted.

Dual-section reels.--This modification allows the crew to change trawls rapidly. The net reel is large and is divided in the middle with a flange. One net with groundlines is attached to each section. The value of the dual-section reel is twofold. If the spare net is carried on the reel, no fishing time is lost when the primary net requires repair. If the vessel operates with nets having different fishing characteristics and each net is carried on a reel, the appropriate net can be set by tying the unused net in place so that it will not loosen when the reel rotates.

*Item on back of card. (over)

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ABSTRACTER: M. F. Tripple

1.84 (Cross Reference: 1.0113)

A bushel basket contained an average of 117 scallops and weighed an average of 45 pounds in the southern area; a bushel basket averaged 150 scallops weighing 50 pounds in the northern area. In both areas, the largest scallops were taken in the shallower depth intervals, and the average size decreased with increasing depth. The size of meats ranged from 28 to 34 counts per pound in samples from the southern area and 51 to 58 counts per pound from the northern area.

The average number of scallops in the dredge catches was about twice as large when the dredge was fished between 30 and 60 fathoms at a scope ratio of 3 to 1 than when fished at 4 to 1. The dredge was more efficient at taking scallops than the modified Eastern otter trawl was, but it was inefficient in taking fish species. Scallops catch by weight made up 61 and 89 percent of the dredge catches but only 5 percent of trawl catches.

Results of 1967 survey.--Of the 48 dredge hauls, 24 contained scallops. The largest catches occurred along the 55- and 60 fathom contour. In the 48 hauls 982 pounds of fish and shellfish were taken.

The 1967 catches were similar to those in 1963 except for the amount of scallops and starfish taken. The starfish were found at all depth intervals in both years; a higher catch rate occurred in 1967. The scallops were found primarily between 40 and 65 fathoms, with the greatest abundance at about 55 fathoms. In 1963, the catch rate of scallops was high in drags between Tillamook Head and Cape Falcon; when these hauls were duplicated in 1967, the best catch was only 10 scallops.

1.22 (Cross Reference: 1.0117)

The highlights of the research results from April 1967 to February 1968 follow:

- (1) Thread herring catches per unit of effort (30-minute set with a 2-inch-mesh monofilament gill net) in Gulf of Mexico waters off St. Petersburg were constant a peak in early summer and declined in the fall when the water temperature fell. Heavy concentrations of herring off Fort Myers during fall and winter indicated a general southerly or possibly offshore movement when the coastal waters are cooling. However, schools of thread herring occurred off St. Petersburg in winter.
- (2) Juvenile thread herring appeared in beach seine samples along Gulf beaches in the St. Petersburg area during summer. These herring disappeared by fall which indicated an offshore movement of juveniles.
- (3) Thread herring reached full sexual development and a fork length of 5 1/2 to 6 1/2 inches off St. Petersburg beach in early April. Spent gonads, which are indicative of spawning, appeared in late May, when the water temperature was about 81° F. The development of gonads indicated a spawning peak in June; no gonads were ripe in July. The gonads of fish caught off Fort Myers during the winter were undeveloped.
- (4) The ratio of males to females in the summer thread herring population off St. Petersburg beach was about 1 to 5; the ratio of the winter population off Fort Myers was about 1 to 1.
- (5) Thread herring with a mean fork length of about 6 inches constituted the bulk of the commercial catches in the Fort Myers area.
- (6) Preliminary analyses of catches of purse seines show that the only important food fish in purse-seine catches were the sand seatrout (*Cynoscion arenarius*) at 0.15 percent of the catch and Spanish mackerel (*Scomberomorus maculatus*) at 0.19 percent. [17 references]

2.114 (Cross Reference: 2.1471)

Use of a third wire winch.--The trawl net reel was modified to work also as a constant-tension third-wire winch in which the tension is varied manually. This third-wire system allows an electrical core wire to be linked with the trawl for various applications. The hydraulic power supply of the reel has a bypass system operating in parallel to the normal hydraulic system of the reel. A controllable relief valve is installed in the bypass to regulate tension. As the tension changes from that required at the control valve, the reel automatically winds in or out to maintain the proper balance. A selector valve is operated to return the reel to its net-handling function. By installing a single electromechanical towing cable on the reel, the system has been used to replace a third-wire depth-telemetry system on a midwater trawl. The third-wire system eliminated the need for underwater connectors to pass telemetry beyond the otter board to the trawl. It also allowed the use of conventional trawl cable on port and starboard tow points and resulted in lower installation costs of telemetry equipment.

Roller roller.--A roller roller is a valuable addition on trawlers with net reels. The stern rail roller reduces chafing and wear to web and ground-lines as they slide over the stern. Rollers are constructed of 8- to 10-inch steel pipe. The length of the rolling surface usually equals the full width of the net reel. Bearings at each end allow the roller to rotate freely.

[Abstracted from: L. Balshine]

The schooling of tuna and porpoises is analyzed, its value to the commercial tuna fisherman is explained, and its effect on tuna seining techniques and practices is described.

Sea Frontiers 14, No. 3, 166-174 (May-June 1968) (Miami, Florida 33149) (Baptist)

Perrin, William F. (Bureau of Commercial Fisheries, Fishery-Oceanography Center, La Jolla, California)

THE PORPOISE AND THE TUNA

2.1475

1.86 (Cross Reference: 1.0134)

at the time $t = 0$, and a is the efficiency of the gear. The equation indicates that a increases linearly with increasing of the cumulative catch (Y).

By using the relation between the efficiency of gear (a) and the swept area of the net, the author has calculated the efficiency of the trawl net in a fishing ground off the coast of Mexico. The results show that the efficiency of the trawl net is about 0.41. This value is considered to be proportional to the efficiency of the trawl net. The value of r represents the efficiency of operation. The average figure for three seasons is $r = 0.79$, which means that 71 percent of the total catch is retained by the net and ropes escape by climbing over the net or by jumping from the ground. From the values of a , the stock biomass at the initial stage of fisheries (X_0) is estimated. The rate of exploitation for stock biomass during the season is 0.41, based on the average of three seasons.

Although the estimated values for the efficiency of gear (a) are fairly consistent for the 1961-63 seasons and three seasons, these values are considered variables that depend on ecological and technical factors, such as distribution of crabs, size of crabs, migration of crabs, efficiency of seining operation, and area of fishing ground. The above analysis did not allow detailed examination of the variability of a due to inefficient data. Information of the biology of crabs is needed to evaluate the reliability of the estimates from ecological and biological standpoints. Despite these problems, the estimates given of 29 percent for the average efficiency of the seining operation and 41 percent for the average rate of exploitation are considered to be the first step in the assessment of the crab population in the Sea of Japan.

2.116	CONFUSING ECHOES (1): SANDEELS Brever, Charles, and Geoffrey Ellis World Fishing 17, No. 5, 30-32 (May 1968)	The bone of the skipper using echo sounding on the Northwest Atlantic grounds is the Greater Sand Eel (<i>Ammodytes lanceolatus</i>), which abounds on many grounds at a certain time of the year. The trace the sand eel produces on the records and CRT (cathode ray tube) presentation is so similar to that of heavy concentrations of cod that there is often confusion. Knowledge of the grounds where sand eels are to be expected, together with the time of year they predominate, makes the skipper more alert and less likely to be misled.	Sand eels migrate down to the seabed during the daylight hours and rise to near the surface at night. When large quantities of sand eels are present, it is useful to watch the recorder chart to observe these shoals approaching during the first daylight tow because sand eels form a major part of the cod diet.	The standard recorder chart produces an easily recognizable record of sand eels. The record consists of a steeplelike trace extending about 25 fathoms up from the seabed, and the trace is formed by about 10 successive echoes at towing speed. When seen on a CRT display, this type of shoal does not give the strong return expected from a dense cod formation. The edges of the echoes on the CRT are more rounded with fewer spikes than those of a cod echo. On a triggered (over)	2.116 WE MIGHT LEARN TO SPOT FISH BY THE SOUNDS THEY MAKE Major, Alan P. Fishing News International 7, No. 5, 37, 90 (May 1968)	The development of suitable underwater-listening apparatus in recent years has made possible the adequate description of the sounds that fish make and an assessment of their use and importance.	In the head of the majority of bony fishes are two flattened bones that respond to vibrations. The fish receive sound waves on these bones, making it possible for them to "hear" and "talk" through the water. Several members of the cod family have striated drumming muscles associated with their gas-filled swim bladder. These muscles contract and produce a sound as part of the fishes' behavior in relation to their own species and other fish. The noises are made as part of their self defense, are connected with aggression, or possibly are part of the reproductive behavior of male fish. Other fish make sounds by forcing air out of their air bladders, gnashing their teeth, quickly opening and closing their mouths, or vibrating their gills against the sides of the head. Such communications give warnings, scare off enemies, show pleasure and anger, and are mating signals.	The sounds have been described as varying from a noise like a soft-shoe dance on a sandy floor, a saw cutting metal, lumps of coal rattling down a chute. (over)	COMMERCIAL FISHERIES ABSTRACTS VOL 22 NO 1 PAGE 5 UNITED STATES DEPARTMENT OF THE INTERIOR FISH AND WILDLIFE SERVICE ABSTRACTER: M. F. Tripple
2.116	CONFUSING ECHOES (2): NIGHT, GROUND AND FISH EFFECTS Draver, Charles World Fishing 17, No. 6, 36-38 (June 1968)	Where the fish are down on the seabed during the daylight hours, a greater number of echoes will be seen at dusk. Although this would normally indicate increased catches, it actually means that a high proportion of the fish that constituted the daylight catch have left the seabed to assume a different formation at night. Whereas nearly all the fish were previously below the headline height, many of them are now above it, and the echoes that merged with the top of the seabed on the CRT (cathode ray tube) during daylight now show a slight gap between them and the bottom echo. When fish are on the seabed, only those that are directly below the ship are recorded. Other fish that are within the spread of the gear are hidden by the seabed echo. About three or four times as many fish echoes will be recorded at night, apparently below headline height, as are seen during the day for a similar catch rate.	The cod fisherman must also take the redfish into account when assessing information from his echo sounder. If the fisherman is on ground where both cod and redfish are present, he must be able to recognize the echoes as distinct from those of other fish. The redfish is more of a deep-water fish than the cod is and (over)	COMMERCIAL FISHERIES ABSTRACTS VOL 22 NO 1 PAGE 5 UNITED STATES DEPARTMENT OF THE INTERIOR FISH AND WILDLIFE SERVICE ABSTRACTER: M. F. Tripple					
2.117	R275,000 UCT RESEARCH VESSEL WILL MAP, EXAMINE VEMA SEAMOUNT Anonymous The South African Shipping News and Fishing Industry Review 21, No. 10, 97, 99 (1966) World Fisheries Abstracts 18, No. 2, 3-4 (April-June 1967)	The 192-gross-ton Thomas B. Davie is equipped to facilitate all types of oceanographic research operations--physical, chemical, biological, hydrological, and meteorological observations; bathymetry; magnetometry; bottom and midwater trawling; subbottom profiling; bottom sampling; coring; and underwater photography. She is 96½ ft. long overall and has a beam of 23 ft. and a draught of 9 ft. Her diesel engine develops 420 hp. continuous and drives a hydraulically operated controllable-pitch propeller. The main generator provides 30 kv.-a. at 380 v., and an auxiliary diesel-driven generator supplies 15 kv.-a. at 220 v. A small lighting plant for use in harbor generates 3 kv.-a. at 220 v.; a 24-v. battery supply is also available for emergency use and for powering certain equipment.	The Davie carries two fiberglass craft--one is 16 ft. long and is propelled by an inboard diesel; the other is an 11-ft. dinghy. Her two-drum, hydraulic trawl winch takes 1,000 fathoms of cable 1½ in. in diameter and is fitted on each side with warping drums. A fixed gantry permits stern trawling. Other weight-raising equipment includes a deep-sea coring/grab winch installed aft of (over)	COMMERCIAL FISHERIES ABSTRACTS VOL 22 NO 1 PAGE 5 UNITED STATES DEPARTMENT OF THE INTERIOR FISH AND WILDLIFE SERVICE EXTRACTOR: L. Baldwin					

2.116 (Cross Reference: 2.146)

is rarely seen in depths of less than 70 fathoms. Redfish will usually be found 20-25 fathoms deeper than cod. The appearance of the CRT trace caused by redfish is similar to that caused by bait. The echoes for redfish are usually in clumps, but they are not as strong as those from cod or sand eels. On the standard recorder chart, they appear as a cloud extending for about 10 fathoms up from the seabed. In the depths of water in which cod are caught, the echoes are not as wide in a horizontal direction and persist for 3 or 4 minutes at towing speed. The solid mark from cod and the gray, indefinite appearance of the redfish trace are distinctly different on the triggered pen recorder.

The steep edges of grounds or crevices on the seabed also produce an effect that is liable to be confused with fish marks. When sounding is being done over an inclined seabed, the first part of the seabed echo is formed by reflections from the part of the bottom nearest the ship; this echo will be to one side or fore and aft of the vessel. These reflections are produced from a weak part of the transmitted beam and are much smaller than would be received normally. Then the strongest part of the echo beam produces larger echoes and the stabilized display recognizes them as being the correct seabed. The weaker echoes that were received first are therefore shown in a position where the fish would normally be, and they are sometimes broken up in a way that they resemble fish echoes. Whether this is due to a steep edge can be quickly confirmed by looking at the standard record to see what the slope is, and, if it is steep, one must be suspicious. The triggered pen chart will show dense black traces if the echoes are due to seabed slope. A steep dip in an otherwise flat ground will produce the same effects.

2.116 (Cross Reference: 2.146)

pen recorder, the traces from both cod and sand eels look alike. Where the shoal of sand eels extends in height to about 5 fathoms from the seabed and the echoes last 4 or 5 min. at towing speed, the trace is quite similar to that for cod; however, the cod marks can last for considerably longer periods than the sand eel marks can. When sand eels diffuse into a less dense concentration, they are easily recognizable from cod because the sand eels produce a faintly cloudy trace on the recorder and give a gray background to the triggered pen chart in contrast to the clearly defined and heavier marks made by cod.

Skippers are often confused by sand eel traces and will tow through what appeared to be excellent marks only to retrieve sand eels caught in the mesh of the trawl. With a suitable trawl, industrial fishing for sand eels, which are rich in protein, might be a considerable success.

Flag weed encountered in shoal water is another confusing phenomenon. Flag weed gives solid echoes that extend about 10 feet above the seabed and are of such a regular and continuous nature that one is immediately suspicious. The top of the echo recorded on the triggered pen recorder is flat and uniform and can easily extend a mile or so. The echo begins and ends abruptly, and the CRT shows a very regular pattern from trace to trace. The size of the echoes does not vary much, and the edges of the echoes do not have the large spikes typical of dense shoals of cod.

2.117 (Cross References: 2.12, 9.11)

the boat deck (it takes 3,000 fathoms of three-stranded wire 11/32 in. in diameter), a hydraulic hydrographic winch (it takes 3,000 fathoms of 5/32-in. wire), an electric bathythermograph winch, a hydraulically driven windlass, and a small gasoline-powered winch for handling current meters and temperature/depth sensors.

The Davie has four laboratories. The main unit's 250 sq. ft. of space is arranged as follows. On the starboard are compressed air supplies, sinks supplying both fresh and sea water, a gimbaled table, and electric power outlets. On the port are the deep-sea echo sounder and facilities for processing and plotting data. Along the center line is a master gyro compass, an outlet supplying 15 kv.-a. at 220 v., and a rack for electronic equipment (a sea-water thermographic recorder has been installed).

One of the laboratories is specially designed for keeping hydrographic samples. In this one-man laboratory, which is air conditioned and can be cooled to 5° C. (41° F.), catches can be kept in sea-water tanks at their normal temperature. The water circulation system also includes a cooling unit. This room can be used as a photographic dark room or for other research work requiring an air-conditioned environment.

Yet another special laboratory, a small space of 14 sq. ft., is equipped for measuring carbon-14 activity.

2.116

and an engine stalling. Haddock produce sounds that are either repetitive knocking sounds or short volleys heard as grunts. Cod make short grunting sounds of a higher intensity than those of haddock. Gurnards produce knocking sounds and growling noises. The total range of sounds produced by other fish is very wide.

The equipment used to pick up sounds from fish is complicated and extremely difficult to use. A sensitive sound detector is a calibrated hydrophone that was specifically designed for this use. Along with the associated pre-amplifier and amplifier, the detector is lowered into the water for working at considerable depths. Recording is done with a tape recorder and a frequency analyzer; an oscilloscope is used for acoustic analyses.

The various echo-sounding devices in use for fish detection on fishing vessels all work on slightly different principles. In modern sonar systems, pulses of sound are sent out in different directions to build up a three-dimensional picture of the sea beneath and before the ship. Even with this equipment, it is difficult to identify the different species of fish shown on an echo sounder. There are, however, differences in the reflectivity or target strength of fish of different sizes and species. Work is being done to improve present techniques in distinguishing between the different types of echo. Research recordings of fish voices at depths from the surface to over 2 miles are being made. This research might make it practical for fishermen to seek shoals of fish and to learn the identity of those species of commercial value.

<p>2.15 THE USE OF SEA-WATER ICE FOR STORAGE OF COD</p> <p>Kelly, K. O., and W. T. Little (Unilever Research Laboratory (Colworth), Greyhope Road, Torry, Aberdeen, Scotland)</p> <p>Journal of Food Technology <u>3</u>, No. 2, 151-158 (June 1968)</p> <p>In some fishing areas where fresh-water ice is scarce or unavailable, the alternatives for preserving the fish are either complete freezing or chilling with ice made from sea water. The use of sea-water ice as a replacement for fresh-water ice in wet storage of cod was investigated. The fish were stored in conventional fish boxes or stored in an insulated stainless-steel box. After 2 hours of bulk storage, the temperature of the fish had dropped from 1.0° C. to just below 0° C. During bulk storage, the temperature of the fish remained between -1.0° and -2.5° C., so that the fish were partially frozen at the end of the storage period. The temperature of the fish stored in boxes was -1.0° C. after 3 days of storage. As the ice became depleted, the temperature rose slowly until it reached +0.6° C. after 9 days of storage. The results showed that sea-water ice melts more rapidly than fresh-water ice. After 9 days of storage in the large tank, the fish still had an excellent covering of ice. Loss of ice in the large tank was much less than from the small boxes.</p> <p>Samples of melting ice from the bulk storage container were taken at intervals for estimation of chloride content. The results showed that in the early stages of storage in sea-water ice, the fish were in contact with a strong salt solution. The low level of sodium chloride at the end of storage in the boxes was due to a greater rate of melting than in the bulk tank.</p> <p>(over)</p> <p>COMMERCIAL FISHERIES ABSTRACTS VOL 22 NO 1 PAGE 7 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE</p> <p>ABSTRACTER: M. F. Tripple</p>	<p>3.15 RADIATION CHEMISTRY OF FOODS.</p> <p>(*) PART I - REACTION RATE CONSTANTS OF SOME FOODS [SIC] CONSTITUENTS WITH HYDRATED ELECTRONS AND HYDROXYL RADICALS</p> <p>Fujimaki, Masao, and Makio Morita (Department of Agricultural Chemistry, Faculty of Agriculture, The University of Tokyo, Japan)</p> <p>Agricultural and Biological Chemistry <u>32</u>, No. 5, 574-579 (May 1968)</p> <p>That OH radicals, hydrated electrons (e_{aq}^-), H radicals, H_2, and H_2O_2 are primary products of the radiolysis of water is an accepted theory. OH and e_{aq}^- mainly arise in the neutral pH region; H is less important. During food irradiation, the water-soluble constituents of food are directly affected by the irradiation and indirectly affected by the active elements of the water, mainly OH, e_{aq}^-, and H. If the solution is dilute, the effect of irradiation on the solutes is negligible, and the reactions occurring in the system are simplified. Although food is not a dilute solution and the treatment of food as a dilute solution affords only a rough approximation of the mechanism of irradiation-induced reactions, the authors felt that a study of dilute solutions of food constituents would provide a useful clue to this mechanism.</p> <p>When a food is irradiated, each of the active elements (OH, e_{aq}^-, and H) is expected to be shared by each constituent in the food. The sharing will be roughly proportional to the product of the element's rate constant and the</p> <p>(over)</p> <p>*Item on back of card.</p> <p>COMMERCIAL FISHERIES ABSTRACTS VOL 22 NO 1 PAGE 7 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE</p> <p>ABSTRACTER: M. F. Tripple</p>
<p>2.15 MICROBIOLOGICAL STUDY OF ICED SHRIMP: EXCERPTS FROM THE 1965 ICED-SHRIMP SYMPOSIUM</p> <p>Carrolli, B. J., G. B. Reese, and B. Q. Ward (Bureau of Commercial Fisheries Technological Laboratory, Pascagoula, Mississippi 39567)</p> <p>Circular 284, 17 pp. (May 1968) (U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Commercial Fisheries, Washington, D.C. 20240)</p> <p>Microbiological studies and summarized results of histological studies are reported in this symposium. The manner in which marine and land bacteria cause spoilage under refrigerated conditions is explained. Total numbers of bacteria, the changing composition of bacterial populations, and organoleptic grades are given for pink, white, and brown shrimp through 14 days of iced storage. The effects of thorough washing are contrasted with those of average washing. The superior quality of well-washed shrimp in the second week of iced storage is shown. Practical recommendations based upon experimental observations or reports in the literature are offered. A series of photomicrographs is given to show how the tissues of shrimps of the three species disintegrate in much the same way during iced storage. A selection of suggested references is provided.</p> <p>The authors believe that a clear understanding of how shrimp spoil is being acquired and the various factors contributing to spoilage are being separated. Certain developments--such as plate-count fluctuations, population changes, and decreases in grade--which appear regularly, are closely related. Microbiological observations have been found to dovetail neatly with the results of chemical</p> <p>(over)</p> <p>COMMERCIAL FISHERIES ABSTRACTS VOL 22 NO 1 PAGE 7 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE</p> <p>ABSTRACTER: M. F. Tripple</p>	<p>3.15 IRRADIATION OF PACIFIC COAST FISH AND SHELLFISH.</p> <p>5. THE EFFECT OF 5' INOSINE MONOPHOSPHATE ON THE FLAVOR OF IRRADIATED FISH FILLETS</p> <p>Spinelli, John, and David Miyauchi (Bureau of Commercial Fisheries Technological Laboratory, Seattle, Washington 98102)</p> <p>Food Technology <u>22</u>, No. 6, 123-125 (June 1968)</p> <p>Work by Kuninaka (1964) and other investigators led the authors to believe that a loss of flavor in stored, irradiated petrale sole filets was related to the degradation of IMP (5'-inosine monophosphate). The authors had found that some loss of flavor in the stored irradiated filets could be restored by the addition of IMP (Miyauchi et al., 1964). Because other flavor potentiators might produce similar results, experiments were conducted to evaluate more fully the relation of IMP and flavor in irradiated fish.</p> <p>The research presented here was done to determine whether the presence or absence of IMP is related to the flavor attributes of irradiated fish. The threshold level of IMP in irradiated fish was determined and taste tests were conducted to determine if irradiated, stored fish containing IMP was preferred to irradiated fish containing no IMP.</p> <p>Flavor threshold of IMP in irradiated fish.--When IMP was added to irradiated petrale sole and Pacific Ocean perch at a level of 0.5 μM per gram, no significant difference could be found between samples. However, when IMP was added at the 1.0 μM per gram level, significant differences at the 5-percent level were</p> <p>(over)</p> <p>COMMERCIAL FISHERIES ABSTRACTS VOL 22 NO 1 PAGE 7 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE</p> <p>ABSTRACTER: M. F. Tripple</p>

studies. When bacteriology, chemistry, histology, and organoleptic evaluations fit together to produce a coherent picture of spoilage, such a picture will be worthy of attention.

The following major points are developed: (1) Bacterial counts are not necessarily a definitive indication of quality, because such factors as shrimp species bottom characteristics, and time must be taken into account. (2) Bacterial populations undergo periodic drastic changes. Certain species drop from a dominant position to one of relative insignificance; other species suddenly increase enormously. Thus, the makeup of populations is probably more significant than is the total number of bacteria. (3) All iced or fresh shrimp eventually spoil, regardless of the care taken. The bacterial population of shrimp touched only by the net and never in contact with man, commercial ice, or the vessel will change.

The following are recommendations for extending the storage life of iced shrimp: (1) Raise the flooring in the hold to reduce pocketing of shrimp and juices and allow the bilge pump to operate efficiently. (2) Use a scrub brush to wash the hold and equipment, and rinse the cleaned surfaces with water containing 200 p.p.m. of chlorine. (3) Seal penboards and cover sheathing with polyethylene. (4) Clean the hose, equipment, deck, and crew's hands during trawling to reduce contamination by land bacteria. (5) Keep the catch shaded. (6) Process the shrimp quickly, washing them well before they are iced. (7) Use enough ice (one part shrimp to two parts ice) to prevent contact of the shrimp with anything except ice. (8) Cap the top and ice the sides of the hold to prevent the shrimp's touching the boat. (9) Maintain a temperature of slightly higher than 32° F. so the ice will melt. (10) Wash the shrimp at the dock. [25 references]

The weight loss of fish stored in the bulk tank was 1.6 percent during the storage period. The appearance of fish from the boxes was quite normal after the storage period. Fish from the storage tank, particularly from the bottom, were rather distorted in appearance; after thawing, the appearance was normal. The yield of skin-on fillets from fish stored in sea-water ice was 42 percent minus belly flap, and the yield after skinning was 39 percent.

The TWA [trimethylamine] content of the muscle was determined throughout the storage period. There was an insignificant increase in TWA values, and the values were well below levels that would make the fish unacceptable from a flavor point of view. Sea-water ice was as satisfactory as fresh-water ice for delaying bacteriological deterioration.

The moisture contents averaged 81.0 percent (± 0.5) before storage and remained unchanged during storage in both types of ice. Ash contents averaged 0.988 percent (± 0.1) and did not change during storage. Fish stored in sea-water ice averaged slightly lower estimations of muscle soluble nitrogen (82.1 percent) than fish stored in fresh-water ice (85.9 percent) did. The estimates were within the range normally expected for fresh fish and indicated that no significant deterioration of the muscle proteins occurred during storage with sea-water ice.

Results of organoleptic testing showed no significantly greater deterioration with sea-water-ice storage than with conventional fresh-water-ice storage. All fish had acceptable flavor and texture scores after 9 days of storage. Softening occurred to a slightly greater extent with fish stored in sea-water ice than in those stored in fresh-water ice. [21 references]

found. When the quantity of IMP was raised to 2.0 μM per gram, differences at the 1-percent level of significance were found. Analysis of some of the samples to which 1.0 μM per gram of IMP had been added showed residual IMP content of about 0.70 μM per gram; the authors believe that the flavor threshold of IMP in fish is somewhere near this level.

Effect of IMP on flavor of irradiated fish.--Fillets of Pacific Ocean perch, English sole, and petrale sole were irradiated and stored. After the storage period, one group of fish was treated so that it contained 1 μM per gram of IMP. The other group was an untreated control. When there was no IMP in the fish, the preferences for Pacific Ocean perch and petrale sole were fairly evenly distributed from "like slightly" to "like extremely" on the hedonic scale. The frequency of scoring with English sole peaked out at "like moderately," but showed considerable tailing into the "dislike" category. Mean scores on the 9-point hedonic scale for the fillets containing added IMP were 7.6, 6.7, and 7.7 for Pacific Ocean perch, English sole, and petrale sole, respectively. The mean scores for the same fish without added IMP were 7.1, 6.4, and 7.2. The differences between the mean scores were significant at the 5-percent level for Pacific Ocean perch and petrale sole, but not for English sole. The samples with IMP were preferred by 62 to 71 percent of the panel.

The intrinsic flavor characteristics of English sole are probably the reason that enhancement of flavor in this fish was not as pronounced as that in the other two species. English sole is a bland fish, so it probably requires more IMP for flavor enhancement. Also, this fish often possesses what is termed an "iodoform flavor," and the high number of dislike scores recorded with English sole reflects this taste characteristic. [14 references]

constituent's concentration. Before the authors began their detailed investigation, therefore, it was necessary for them to estimate this sharing by determining constants for the reaction rate of several food constituents with OH and e^{aq} . The reaction of 13 amino acids with OH and e^{aq} was measured by competition methods; H-formate and nitrous oxide were the respective competitors. Results are tabulated.

The reaction rate constants of some food constituents with e^{aq} and OH were measured by competition methods. Nitrous oxide was used as a competitor with e^{aq} , and 3H-formate with OH. High selectivity was seen among the reactions with e^{aq} . The reaction rate constants of e^{aq} with some food constituents were $1010 \text{ M}^{-1} \text{ sec}^{-1}$ for cysteine, and $109 \text{ M}^{-1} \text{ sec}^{-1}$ for methionine, ascorbic acid, and histidine; much smaller rates were obtained with sugars and other types of amino acids. The reaction rate constants of OH ranged from $10^6 \text{ M}^{-1} \text{ sec}^{-1}$ for cysteine, histidine, methionine, aromatic amino acids, and ascorbic acid to $108 \text{ M}^{-1} \text{ sec}^{-1}$ for sugars and other amino acids. The reactions with OH appeared to be less selective than those with e^{aq} were. Selective destruction of cysteine and ascorbic acid during irradiation of food may be partly attributed to their selective reactivities with some less reactive species that are produced by reactions of e^{aq} or OH with oxygen or the other constituents, as well as their higher reactivity with e^{aq} . [14 references]

DETERMINATION OF AMINO ACIDS IN γ -IRRADIATED TUNA EXTRACT

Shiral, Kazuo, and Tadefake Oku (Nippon Univ., Tokyo, Japan)
Chemical Abstracts 68, No. 25, 113438w (June 17, 1968)

SINGLE AND MULTIPLE DOSES
IN THE RADIATION PASTEURIZATION OF SEAFOODS

Liston, J., and Jack R. Matches (Food Science, College of Fisheries, University of Washington, Seattle 98105)
Food Technology 22, No. 7, 81-84 (July 1968)

Prior experiments by the authors had indicated that bacteria are most sensitive to gamma radiation in the early log phase of growth. This finding was also reported by Stapleton (1955) for *Escherichia coli* irradiated with X-rays. These data suggested that the application of a second, low-level dose of radiation to seafoods at a suitable interval after the primary irradiation might produce a disproportionately large kill of spoilage bacteria and markedly extend the shelf life of the product. Studies were undertaken of the effect of double doses of irradiation on the shelf life of refrigerated fish.

In separate experimental runs, packaged fillets of English sole (*Parophrys vetulus*), taken from freshly caught fish that had been iced for 8 and 16 days were irradiated with single doses in the range of 50 to 300 Krad. The fillets were stored at 1.1° C. before and after irradiation. A bacterial count of 10⁶ per gram was considered a conservative index of shelf life in irradiated seafood. Fresh fish, which carried an initial count of 10³ bacteria per gram, reached a count of 10⁶ per gram in 18, 24, 28, and 35 days of storage after a single radiation dose of 100, 150, 200, and 300 Krad, respectively. Fresh fish with the same initial bacterial population reached a count of 10⁶ per gram in 32, 34, 31, (over)

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ABSTRACTER: M. F. Tripple

STUDIES ON THE BROWN DISCOLORATION OF FISH PRODUCTS.
I - FACTORS AFFECTING THE DISCOLORATION

Fujimoto, Kenshiro, Masayuki Maruyama, and Takashi Kaneda (Depart. of Food Chem., Fac. of Agr., Tohoku Univ., Sendai, Japan)
Bulletin of the Japanese Society of Scientific Fisheries 34, No. 6, 519-523 (June 1968) (In Japanese; abstract, figures, and tables in English)

The development of brown discoloration of fish products during storage is often a serious problem because the discoloration is usually associated with off-flavor and a deterioration of nutritional value. Apparently, the discoloration is the reaction of various amino compounds and the carbonyl compounds of autoxidized oil; however, the detailed mechanism of this reaction is not known. To ascertain what kind of amino and carbonyl compounds are the major substances in the brown discoloration, the following experiment was conducted.

The amino compounds were separated from boiled, dried anchovy; dried mackerel; and salted trout. These compounds were divided by steam distillation into volatile and nonvolatile fractions, which were then shaken with both the autoxidized methyl linoleate and the methyl ester of cuttlefish-liver oil at 40° C. for 4 hours. The colored ether-soluble fraction was dissolved in ethanol, and the optical density of the solution at 430 mμ was measured.

Though the discoloration of the nonvolatile fraction was negligible, the volatile fraction discolored appreciably. This discoloration suggested that in the (over)

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RADIATION PASTEURIZATION OF SEAFOOD

FACTORS AFFECTING BROWN DISCOLORATION OF FISH PRODUCTS

PRODUCTION OF TRIMETHYLAMINE IN FROZEN COD MUSCLE

Castell, C. H., D. M. Bishop, and Wanda E. Neal (Fisheries Research Board of Canada Halifax Laboratory, Halifax, Nova Scotia)
Journal of the Fisheries Research Board of Canada 25, No. 5, 921-933 (May 1968)

During 1966 and 1967, a series of tests were carried out to follow some of the changes that were occurring in fillets of cod and other fish that had been frozen and stored at different temperatures. TMA (trimethylamine) was determined to test the belief that TMA is not formed in the stored muscle under conditions that prevent bacterial activity. Contrary to the expectations of the authors, the TMA did increase in many of the stored frozen fillets. The present paper deals with these increases, the conditions under which they occurred, and their probable relation to other changes that occurred in the frozen fish.

Temperature was a major factor in determining the rate of the increase of TMA in fish muscle during frozen storage. There was no detectable increase of TMA in cod fillets stored up to 700 days at -26° C.; there was a slow increase for fillets at -12° C.; and there was a fairly rapid increase at -3.3° C. The range of TMA values was much lower than that encountered during the deterioration of unfrozen fish. TMA values higher than five were rarely encountered. Occasionally, after storage periods ranging between 30 and 80 days, psychrophilic bacteria developed rapidly on fillets held at -3.3° C., and the TMA values rapidly increased to levels between 20 and 60. When cod fillets were stored at -23° C. and -18° C. for up to 200 days, there was no increase in TMA values at -23° C., and there was a slight increase at -18° C. (over)

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ABSTRACTER: M. F. Tripple

CARCINOGENS IN FOOD

Tilgner, Damazy Jerzy (Dept. of Animal Products Technology, Politechnika Gdanska, Gdansk, Poland)
Food Manufacture 43, No. 6, 37-39, 42 (June 1968)

The distribution of carcinogens in the environment has led to numerous studies of the materials that might be ingested by man, either as food or as food additives. More than 450 compounds have been found to be carcinogenic; more than 200 of these are polycyclic aromatic hydrocarbons or their derivatives. Much attention has been focused on the carcinogenic constituent of coal tar, benzo[a]pyrene (3,4-benzopyrene), because it is considered a useful indicator of the type of compounds present in carcinogenic materials.

During smoke curing, the product absorbs benzo[a]pyrene, along with other constituents of smoke. Different levels of carcinogens have been found in smoked foods, in amounts related to such factors as method of smoke generation, temperature of combustion and oxidation, air supply, and density and temperature of smoke cure. The results of several investigations on the benzo[a]pyrene content of various smoked products are summarized on the back of the card.

The role of polycyclic aromatic hydrocarbons in carcinogenesis was emphasized by a study of two comparative population groups--Baltic fishermen and a (over)

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TRIMETHYLAMINE IN FROZEN COD MUSCLE

CARCINOGENS IN SEAFOODS

3.2491

development of brown discoloration, the action of the volatile fraction, which included ammonia and trimethylamine, was more pronounced than that of the nonvolatile fraction, which included amino acids. The volatile amino compounds from 5 grams of dried mackerel reacted maximally with 0.5 g. of the autoxidized methyl ester of cuttlefish-liver oil.

During the development of discoloration, the amount of unsaturated carbonyl compounds decreased, whereas the decrease of saturated carbonyl compounds was limited. This indicated that the role of unsaturated carbonyls in the discoloration reaction is more important than the role of the saturated carbonyls. [8 references]

Reaction of autoxidized oil mixed with amino compounds from fish products

Source of amino compound	Autoxidized oil	Volatile base (ammonia mg.%)	Optical density at 430 mμ	
			Control fraction	Nonvolatile fraction
Boiled, dried anchovy	Methyl linoleate	57.0	0.015	0.053
Dried mackerel	Methyl ester of cuttlefish-liver oil	12.2	0.073	0.080
Salted trout	Methyl ester of cuttlefish-liver oil	5.1	0.060	0.064
				0.137
				0.335
				0.237

3.19 (Cross Reference: 3.15)

and 36 days after multiple radiation doses of 50 + 50, 50 + 100, 100 + 100, and 100 + 200, 100 + 50, 150 + 50, 200 + 50, respectively. Cumulative equivalent double dose treatment was 15 and 32 days at 100 Krad, 24 and 34 days at 150 Krad, 28 and 31 days at 200 Krad, and 35 and 36 days at 300 Krad. Treatment with 100 Krad followed by 50 Krad 7 days later apparently will extend the shelf life of fresh sole filets by the same amount as a single dose of 300 Krad.

Experiments using fish iced 8 and 16 days before radiation indicated that the effectiveness of both single and double dose treatments decreased as the bacterial count increased. Fish iced 8 days had bacterial counts of 10^4 per gram. Using 50 + 100 Krad, the second dose was effective if it was administered within 3 days of the first dose, but no later. Fish iced 16 days had bacterial counts of $10^{2.5}$ per gram. Single doses of 50, 100, and 150 Krad delayed outgrowth to 106 by 2 days, but double doses of 50 + 100 Krad were essentially ineffective.

Filets prepared from irradiated whole fish at 50 Krad and stored for 7 days had a shelf life that was 1 to 2 weeks longer than filets from comparable fish that were not irradiated.

Multiple dose treatments appear feasible and desirable for fish irradiated on board ship where the second dose can be given upon landing. The method cannot be used to falsify the bacterial quality of a seafood product because spoiled seafoods with counts above 10^4 per gram do not respond to the second dose.

3.4

group living inland. The fishermen ate considerable quantities of smoked fish and had incidences of all neoplasms and gastrointestinal cancer that were three times and four times, respectively, that of the inland population who did not eat smoked fish. Heavily smoked Icelandic fish contains appreciable amounts of benzo[a]pyrene; the people of Iceland have a high incidence of stomach carcinoma.

Product investigated	Benzo[a]pyrene content $\mu\text{g/kg}$	Comments
Various smoke-cured foods	1.7 - 53.0	36% of carcinogen diffused into the inner parts
Hot-smoked Baltic herring	3.3 - 6.7	26% in subcutaneous layers
Cold-smoked fish	0.1 - 3.3	the average amount found
Hot-smoked herring	8.5	
Cold-smoked herring	0.8	
Smoked sausage	1.9 - 10.5	
Smoked fish	1.7 - 7.5	carcinogen always present
Conventionally smoked fish	4.1 - 60.0	
Electrostatically smoked sprats	0.7 - 1.7	

Eight different polycyclic aromatic hydrocarbons were found in an amount of about 1 milligram per kilogram of smoked oysters. The benzo[a]pyrene content amounted to about 2-6 $\mu\text{g/kg}$ of smoked oysters. Although it must be assumed that the quantities of polycyclic aromatic hydrocarbons in oysters vary with the habitat, it has been definitely shown that oysters are capable of taking up these hydrocarbons from their environment. [40 references]

3.2495

Although simultaneous reactions are not necessarily related, the authors felt it would be interesting to determine whether the increase in TMA values coincided with any of the other chemical changes occurring in frozen filets. There was no change in oxidative rancidity in cod filets stored at -12°C . for 200 days. Lipid hydrolysis commenced at the beginning of the storage period. There was no measurable decrease in extractable protein until about 20 days of storage had elapsed. It was also about 20 days before the first increase in TMA values appeared.

The chronological relations between the development of TMA and changes in fat and protein were more evident when the TMA values were plotted against the content of free fatty acids. Irrespective of storage temperature, there appeared to be a straight line relation between increase in TMA and decrease in extractable protein. Also irrespective of storage temperatures, the free fatty acids increased to a level of somewhere between 20 and 30 percent of the extractable fat before the TMA began to rise. Similar relations were shown between TMA and these other changes in a large number of frozen filets. The same general relation always existed: irrespective of storage temperature, as the TMA increased, the amount of extractable protein decreased until about 70 percent had become inextractable, after which there was no further change. TMA never formed in frozen fish muscle under storage conditions that prevented protein denaturation, even though the free fatty acids had increased. [38 references]

4.11 COMMERCIAL REDFISH AND FLATFISH (FLOUNDER) OILS:
COMPARATIVE FEATURES OF FATTY ACID COMPOSITION

Ackman, R. G., and P. J. Ke (Fisheries Research Board of Canada Halifax Laboratory, Halifax, Nova Scotia)
Journal of the Fisheries Research Board of Canada 25, No. 5, 1061-1065 (May 1968)

Although production of marine oils in Canada is based largely on reduction of herring (clupeids), there is commercial production of oils from redfish and flatfish (usually flounder or sole). Oils from redfish and flatfish contain modest amounts of vitamins and for this reason are sometimes used as replacements for cod-liver oil. The properties and fatty-acid compositions of these oils have not been investigated. The authors hoped to find points of fatty-acid composition that would differentiate commercial oils of comparable I.V. (iodine values).

The fatty-acid compositions were typical of triglyceride marine oils. There were the usual wide fluctuations in percentages of particular fatty acids in various samples of the same marine oil. An obvious difference between the two oils was the greater proportion of 20:1 and 22:1 in the redfish oil than in the flatfish oil. The ratio 22:1 > 20:1 in the redfish oils was interesting because this is usually considered a characteristic of clupeid oils. There is reason to associate this ratio of fatty acids in fish oils with the dietary habits of clupeids and redfish and with the fatty-acid composition of certain planktonic crustaceans. Flatfish such as flounder feed on smaller bottom fauna, and this food may modify the depot fat.

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ABSTRACTER: M. F. Tripple

4.13 ANALYSIS OF ARSENIC IN MARINE OILS
BY NEUTRON ACTIVATION EVIDENCE OF ARSENO ORGANIC COMPOUNDS

Lunde, Gulbrand (Central Institute for Industrial Research, Blindern, Oslo 3, Norway)
Journal of the American Oil Chemists' Society 45, No. 5, 331-332 (May 1968)

Many investigators seem to agree that arsenic appears as one or more arseno organic compounds in marine oils. Sandolin (1928) found that, by extracting cod-liver oil with alcohol, he could enrich the arsenic content from 3.9 milligrams per kilogram to 100 mg. per kg. Further treatment produced a fraction containing 1,000 mg. of arsenic per kg. These studies formed the basis for the opinion that the compound containing the arsenic had a closer resemblance to the phospholipids than to the neutral lipids.

The purpose of the present work was to study in detail whether arsenic replaces phosphorus in phospholipids or whether it exists as one or more independent arseno organic compounds. The oils from the liver of cod (*Gadus morhua*) and from herring (*Clupea harengus*) were examined. The phospholipids from these oils were fractionated, and each fraction was analyzed by neutron activation. In the first experiments, the fractions were separated on a silicic acid column with chloroform-methanol mixtures as eluting agents. Fractionation with an automatic fraction-collector was employed in a later experiment to obtain a more exact elution diagram.

(over)

COMMERCIAL FISHERIES ABSTRACTS VOL. 22, NO. 1, PAGE 11
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

ABSTRACTER: M. F. Tripple

FATTY-ACID COMPOSITION OF REDFISH AND FLOUNDER OILS

ANALYSIS OF ARSENIC IN MARINE OILS

3.5 A QUICK-SALTING PROCESS FOR FISH
2. BEHAVIOR OF DIFFERENT SPECIES OF FISH
WITH RESPECT TO THE PROCESS

Del Valle, F. R., and J. L. Gonzalez-Inigo (School of Food Technology and Marine Sciences, Instituto Tecnológico de Monterrey, Guaymas, Sonora, Mexico)
Food Technology 22, No. 9, 85-88 (September 1968)

Preserving fish by salting can be a very lengthy process--it can take as long as 20 days. In warm climates, this amount of time creates a problem, for the fish start to decompose before enough salt has penetrated to exert a preserving action. Nevertheless, preservation by salting is of considerable interest in developing countries because it is inexpensive, it requires very simple equipment and no special skills, and it yields a high-quality protein. If this means of preservation is to become more practical, however, salting times must be lowered. In 1968, Del Valle developed a quick-salting process that greatly decreased the time required to salt shark. In this present work, he and his co-author investigate the possibilities of applying the process to other species of fish.

Carp (*Cyprinus carpio*) from the Gulf of Mexico and skipjack (*Katsuwonus [Thunnus] pelamis* L.), dolphin (*Coryphaena hippurus* L.), Spanish mackerel (*Scomberomorus sierra*), and mullet (*Mugil cephalus*) from the Gulf of California were subjected to the quick-salting process. The process involved grinding the fish muscle; combining the muscle with salt; pressing the mixture; and allowing the pressed cakes to dry.

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COMMERCIAL FISHERIES ABSTRACTS VOL. 22, NO. 1, PAGE 11
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

ABSTRACTER: S. G. Cordell

4.11 ISOLATION AND ANALYSIS OF TRIENIC AND TETRAENIC FATTY ACIDS
(*) WITH COMPLEMENTARY THIN LAYER AND GAS-LIQUID CHROMATOGRAPHY

White, Harold B., Jr., and Shirley S. Powell (Department of Biochemistry, The University of Mississippi School of Medicine, Jackson)
Journal of Chromatography 32, No. 3, 451-457 (February 6, 1968)

In an earlier report (White, 1966), the author described a procedure for the analysis of fatty-acid methyl esters through the complementary use of thin-layer and gas-liquid chromatography. Unsaturates were separated as their mercury adducts into groups according to the number of double bonds by thin-layer chromatography. Members of each unsaturation class were then analyzed by gas-liquid chromatography. Synthetic fatty-acid mixtures containing mostly saturates and monoenes were also evaluated with this approach.

In the present report, the authors describe the improvement of the procedure and its use to separate the polyunsaturated components of a complicated mixture--the trienoic and tetraenoic fatty acids of menhaden fish oil. The report points out the value and capability of the complementary approach in analyzing complex mixtures at the submilligram level.

When the method was applied to a study of the trienoic and tetraenoic fatty acids of menhaden oil, these fatty acids were shown to be considerably more complex than had been realized. At least 17 trienoic acids were found, ranging in chain

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COMMERCIAL FISHERIES ABSTRACTS VOL. 22, NO. 1, PAGE 11
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

ABSTRACTER: M. F. Tripple

QUICK-SALTING PROCESS FOR FISH

CHROMATOGRAPHIC PROCEDURE FOR FATTY-ACID ANALYSIS

4.13 (Cross Reference: 4.15)

The results of the first experiments indicated that the arsenic content in the phospholipid fractions is highest in the fractions eluted with from 20 to 30 percent methanol. Results from the experiment using an automatic fraction-collector indicated that two arseno organic compounds are present. One compound was eluted with about 20 volume percent of methanol and the other with from 25 to 30 volume percent methanol. The arsenic content in one of the fractions was about 3,000 P.P.m. The phosphorus content in the fractions ranged from 1.9 to 3.9 percent. The ratio between arsenic and phosphorus in the fractions of phospholipids thus could be calculated.

Arsenic in phospholipid fractions

Fraction	Eluting agent	Eluting volume ml.	Arsenic in phospholipids	
			Cod-liver oil P.P.m.	Herring oil P.P.m.
1	Chloroform	500	1.0	0.8
2	Acetone	150	18.0	23.0
3	0.5% methanol in chloroform	200	26.0	34.0
4	7% methanol in chloroform	250	11.2	34.0
5	12% methanol in chloroform	250	24.3	30.0
6	17% methanol in chloroform	250	85.0	225.0
7	22% methanol in chloroform	500	308.0	900.0
8	27% methanol in chloroform	250	718.0	911.0
9	>27% methanol in chloroform	250	427.0	590.0

The author concludes that the chemical properties of the two arseno organic compounds, or arseno lipids, resemble the properties of the phospholipids. The fish itself or organisms contained in the food of the fish probably synthesize these compounds.

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The proportions of 16:0 to total saturates for the redfish and flatfish oils were not markedly different from the values of about 60 percent previously reported for oils of other species. The ratios for 16:0/(16:1+18:1) differentiated both redfish and flatfish oils from herring oils but did not differentiate them from sable fish or Greenland halibut. No obviously unique features were found in the polyunsaturated fatty acids of either redfish or flatfish oil. The conversion 20:5 ω 3 \rightarrow 22:6 ω 3, which gave nearly equal percentages of these two acids in cod-liver oil, evidently does not occur to the same extent in redfish and flatfish.

The fatty-acid chain-length distributions were informative. There was no emphasis on any one chain length in redfish, whereas in clupeids and Greenland halibut a general rule of C16 > C18 and C22 > C20 was noticeable in oils with I.V. of less than 125. Five samples of redfish oils collected from storage tanks had I.V. of 115, 116, 119, and 125 and were thus distinguishable by chain-length distribution of fatty acids from other marine oils of comparable I.V.

The flatfish oil was chiefly notable for the low proportion of C22 relative to C20. This oil was broadly similar to cod-liver oil in composition. The differences in the percentages of C18 in flatfish, which were lower than C16 and C20, was a definite dissimilarity when compared with cod-liver oil. It appeared possible that at least some commercial oils of comparable I.V. could be distinguished by differences in proportions of certain fatty acids and of fatty-acid chain lengths.

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length from 12 to 24 carbons. A minimum of 15 tetraenoic acids was found, extending over a range of chain lengths similar to that of the trienoic acids, and with C18 and C20 acids prominent. [14 references]

[abstract: M. F. Tripplie]

[62 references]

4.19

BIOSYNTHESIS OF SURFACE LIPIDS

Kolattukudy, P. E. (Department of Biochemistry, Connecticut Agricultural Experiment Station, New Haven)

Science 159, No. 3814, 498-505 (February 2, 1968)

Surface lipids are responsible for the water-repellent character of the surfaces of plants, animals, and insects. The surface lipids differ in chemical composition from the internal lipids. Collectively, the surface lipids are called waxes because of their peculiar physical properties; however, in strict chemical terms, wax refers to esters of long-chain alcohols with long-chain acids. Identification of wax components has been progressing at a rapid rate. The biosynthesis of the unusually long carbon chains found in waxes has been the subject of much conjecture. It has only been recently that any knowledge has been gained concerning the formation of surface lipids in nature. On the basis of experimental evidence, the most likely pathway for paraffin biosynthesis appears to be elongation of a common fatty acid such as palmitic to very long-chain fatty acids of appropriate chain length, followed by decarboxylation. This hypothesis cannot be confirmed until the enzymes involved are isolated. [62 references]

A certain minimum amount of salt was needed so that the mixtures would lose water readily and form cakes. If the salt exceeded this minimum, the pressing would produce hard, brittle cakes; if it were less than the minimum, pressing would only produce gelatinous masses. The authors discovered that the minimum amount of salt needed for each species corresponded to the water-holding capacity of the fresh muscle. Results of the evaluation tests run to determine the amounts of salt needed are tabulated. The content of moisture, salt, and protein was determined in the samples of salted muscle before and after the muscle was pressed, and in the press juice. The results are tabulated below.

Material balance calculations showed that protein lost in the press juices and in the water used to leach the pressed cakes was negligible. However, both solutions had a high concentration of salt, which led the authors to conclude that this salt could be recovered and reused in a large-scale salting operation. The product was high in nutritional value, economically feasible, and could be stored in a wide range of temperatures without refrigeration.

Fish	Moisture content			Salt content			Protein content		
	A	B	C	A	B	C	A	B	C
	Percent			Percent			Percent		
Spanish mackerel	51.5	37.0	75.3	33.8	43.5	37.4	18.3	32.5	0.1
Mullet	55.7	38.7	72.9	29.6	37.0	39.4	14.6	30.4	0.4
Skipjack	49.4	43.3	70.9	32.2	35.6	36.5	18.8	26.9	0.3
Carp	55.8	48.2	73.8	29.1	31.3	36.8	22.8	31.7	1.5
Dolphin	54.5	49.5	67.9	24.0	22.7	40.3	11.7	16.7	0.0
A - in muscle before being pressed; B - in muscle after being pressed; C - in press juice									

BIOSYNTHESIS OF SURFACE LIPIDS

4,14
(*)

SEPARATION AND CHARACTERIZATION OF FATTY ACID AMIDES
FROM VISCERAL LIPID OF FIN WHALE

Nakamura, Takashi, Tadaaki Hosokawa, and Masamichi Toyomizu (Lab. Fish. Tech.,
Kyushu Univ., Fukuoka, Japan)
Bulletin of the Japanese Society of Scientific Fisheries 34, No. 3, 220-224
(March 1968)

The Fishery Technology Laboratory at Kyushu University has shown that cer-
tain lipids from fin whale viscera, when eluted chromatographically with methanol-
chloroform after the neutral lipids were eluted with ethyl ether, have infrared
absorption spectra of 5.96 and 6.28 μ owing to the amide linkage. On the basis
of chemical tests, thin-layer chromatography, and infrared absorption spectro-
scopy, the authors judged that these lipids were neither phospholipids, glyco-
lipids, nor sphingolipids. Therefore they determined to separate and charac-
terize them.

The amide lipids from the visceral lipid of fin whale were separated by
column chromatography, mild alkaline hydrolysis, and preparative thin-layer
chromatography. The lipid components were analyzed after 2N HCL hydrolysis in
80 percent methanol.

The ether-soluble moieties of the lipids consisted of fatty-acid methyl
esters and small amounts of unmethylated fatty acids. After remethylation with
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UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

ABSTRACTER: L. Baldwin

5,7
(*)

DISTRIBUTION OF VITAMIN E IN A FEW SPECIES OF FISH

Sugii, Kisaburo, and Toyosuke Kinumaki (Tokai Reg. Fish. Res. Lab.)
Bulletin of the Japanese Society of Scientific Fisheries 34, No. 5, 420-428
(May 1968) (Abstract, figures, and tables in English)

Very little work has been done on the vitamin E content of fish tissues,
and practically no data are available on the distribution of vitamin E in every
part of the fish body. This paper reports a new method for the estimation of
vitamin E in fish tissue. The method is based on a combination of two previous
methods devised by Mori-Naito and Katsui-Nishimoto. The distribution of vitamin
E in the bodies of skipjack, rainbow trout, and carp was studied.

The following results were obtained:

1. Under normal conditions, vitamin E was fairly evenly distributed in
every organ or tissue of all three fish.
2. The distribution pattern of vitamin E was quite different from those
of vitamins A and D. This difference may suggest that in function, vitamin E
resembles water-soluble vitamins more than it does fat-soluble vitamins.
3. The distribution pattern could be changed by feeding rainbow trout an
excess of vitamin E; in this case, the vitamin accumulated in the ovary.
4. Carp with nutritional muscular dystrophy showed a distribution of
vitamin E that was different from that of normal fish. [34 references]

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UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

ABSTRACTER: M. F. Tripple

FATTY-ACID AMIDES OF FIN WHALE LIPIDS

DISTRIBUTION OF VITAMIN E IN FISH

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(*)

INDUSTRIAL FISHERY PRODUCTS 1967 REVIEW

Anonymous

Situation and Outlook 1, No. 1, 40 pp. (April 1968) (U.S. Department of the Inter-
rior, Fish and Wildlife Service, Bureau of Commercial Fisheries, Branch of
Current Economic Analysis, Washington, D.C. 20240)

Fish meal.--The total U.S. production of fish meal in 1967 was estimated by
the Bureau of Commercial Fisheries to be 185,400 short tons, which was a decline
of 12 percent from 1966 production and 24 percent from the 1962-66 average produc-
tion. Most of this decline was due to decreased menhaden landings and menhaden
meal production. The United States imported 651,500 short tons of fish meal in
1967, which was 45 percent more than the amount imported in 1966 and 82 percent
higher than the 1962-66 average. With the increase in imports more than offset-
ting the decrease in production, total U.S. supplies of fish meal were estimated
at 836,900 short tons in 1967. This was an increase of 27 percent over the 1966
total and 39 percent over the 1962-66 average. Imports accounted for 78 percent
of total supplies in 1967, as compared to 68 percent in 1966 and an average 59
percent for 1962-66.

Fish oil.--U.S. production of fish oil in 1967 totaled 119.6 million pounds,
which was a decline of 27 percent from 1966 and 39 percent from the 1962-66 aver-
age. Menhaden oil accounted for 82 percent of the total production of fish oil.
Stocks of fish oil at the end of 1967 totaled 80 million pounds, 19.4 million
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COMMERCIAL FISHERIES ABSTRACTS VOL 22 NO 1 PAGE 13
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

ABSTRACTER: M. F. Tripple

6,190

THE NUTRITIVE CONTENT OF MENHADEN (BREVOORTIA TYRANNUS
AND PETRONUS) FISH MEAL EVALUATED BY CHEMICAL METHODS

Kifer, R. R., W. L. Payne, D. Miller, and M. E. Ambrose (Bureau of Commercial
Fisheries Technological Laboratory, College Park, Maryland)
Feedstuffs 40, No. 20, 36-37 (May 18, 1968)

The Bureau of Commercial Fisheries Technological Laboratory at College Park,
Maryland, conducted extensive chemical and biological tests on menhaden fish meal.
The data reported in this article describe the chemical content of menhaden fish-
meal samples. The
average values for
the calcium and
phosphorus content
the mineral con-
tent, and the
amino-acid compo-
sition are pre-
sented in the
Moisture
accompanying ta-
bles. The hand-
book value is
the average
value of each nu-
trient decreased
by one-half stand-
ard deviation and

Constituent	Percent	Average amount	Handbook value	Mineral	Average amount	Handbook value
Protein	62.01	61.36	61.36	Iron	P.P.m.	*
Ash	18.03	17.16	17.16	Copper	438.0	371.0
Ether fat	10.22	9.45	9.45	Zinc	11.4	9.65
Total fat	12.38	11.65	11.65	Manganese	150.8	145.6
Moisture	8.25	7.63	7.63	Chromium	35.6	27.6
Calcium	5.26	4.94	4.94	Boron	11.0	9.6
Phosphorus	2.98	2.83	2.83	Barium	14.1	12.9
Sodium	0.34	0.31	0.31	Strontium	20.4	12.9
Magnesium	0.14	0.135	0.135	Aluminum	63.3	53.2
Potassium	0.72	0.65	0.65		352.0	283.0

*Average value decreased by $\frac{1}{2}$ standard deviation.

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UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

ABSTRACTER: M. F. Tripple

REVIEW OF INDUSTRIAL FISHERY PRODUCTS, 1967

COMPOSITION OF MENHADEN FISH MEAL

7.461 USING THE COTLOVE TITRATOR FOR MEASURING CHLORIDE IN MARINE PRODUCTS

Bornett, H., and R. W. Nelson (Bureau of Commercial Fisheries Technological Laboratory, Seattle, Washington 98102)
Food Technology 22, No. 6, 139-141 (June 1968)

One of the many factors affecting the quality of marine products is salt, which is commonly used to enhance the flavor of the product. The concentration of salt in fishery products varies widely because of difficulties in adjusting the levels during processing. The lack of a rapid and simple method for analyzing the salt content of a product hinders proper control. A number of methods of analysis are available; however, they usually involve lengthy procedures and tedious sample preparation. The Cotleve chloride titrator, a coulometric procedure, was evaluated as a quality-control device to measure the concentration of salt in fishery products. The representative fishery products sampled were crab, halibut held in refrigerated sea water, and tuna.

The salt was extracted from the samples by adding 25 milliliters of distilled water per gram of sample. The mixture was heated to boiling, which took about 10 min., and then cooled to room temperature. A 0.1- to 1.0-ml. aliquot (depending on the salt concentration) of the cooled solution was analyzed by the procedures described for the Cotleve Chloridometer.
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COMMERCIAL FISHERIES ABSTRACTS VOL 22 NO 1 PAGE 15
UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: M. F. Tripple

6.190 NUTRITIONAL VALUE OF FISH VISCERAL MEALS

Olley, June, J. E. Ford, and A. P. Williams (Torry Research Station, Aberdeen, Scotland and National Institute for Research in Dairying, Shinfield, Reading, England)
Journal of the Science of Food and Agriculture 19, No. 5, 282-285 (May 1968)

The viscera of demersal species of fish constitute from 6 to 9 percent of the gutted weight. Almost all the demersal fish landed in Britain during 1965 were gutted at sea. Much of the viscera were processed on factory freezing trawlers; those from kippers were made into fish meal if the kippers house viscera were in the vicinity of a fishmeal factory. For the most part, however, the viscera were discarded. Had they been processed at sea or brought ashore they would have provided an additional 50,000 tons of raw material for fishmeal manufacture in England.

Viscera are difficult to process because they readily autolyze. Pressing is necessary with demersal species to obtain the low oil content specified for white-fish meal; however, the viscera are difficult to handle in a screw press after cooking. Because of the technical difficulties, little effort has been made to process fish viscera. Even if the necessary technology were available, the question would still arise as to whether or not fish viscera are a potentially valuable source of high-quality protein. This paper compares the biological and chemical ratings of protein quality and amino-acid compositions of meals
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UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: M. F. Tripple

6.54 THE FISH PROTEIN CONCENTRATE STORY.
7 - NEW METHOD OF FPC PRODUCTION FOR FOOD USE

Caiozzi, M., L. Arrieta, L. Villarroel, and E. Rauch (Department of Chemistry of the Faculty of Chemistry and Pharmacy, University of Chile, Santiago, Chile)
Food Technology 22, No. 6, 100, 102 (June 1968)

The most promising methods for producing FPC (fish protein concentrate) are based on extraction with organic solvents to form azeotropic mixtures. In this report, the authors present the results of preliminary experiments on the use of a surface active agent, sodium lauryl sulfate, in an aqueous system to extract fat from eviscerated hake (Merluccius gavi). One of the concentrates tested was a commercial, full-fat FPC prepared from many species of fish, the predominant fish being the hake. The authors also tested an FPC prepared in the laboratory from eviscerated hake.

Analyses showed that the commercially prepared samples had a moisture content of 10.2 percent; the samples prepared in the laboratory, 2.4 percent. To remove the fat, the authors wetted well homogenized, comminuted fish with 50 milliliters of distilled water. Various volumes of a 5 percent aqueous sodium lauryl sulfate solution were added with various stirring periods. Several experiments were run at different pH of the detergent-removing rinse water and at different temperatures. The formed emulsion was broken, and the liquid was removed by centrifugation. After the residue was rinsed with 200 ml. of distilled water, it was dried for 8 hours at 80° C. The best results were obtained with 100 ml. of 5 percent
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UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE ABSTRACTER: M. F. Tripple

7.49 GAS CHROMATOGRAPHIC ANALYSIS OF MALATHION IN WATER AND IN FISH

Ragab, Mohamed Tawfik H. (Canada Department of Agriculture, Research Branch, Kentville, Nova Scotia, Canada)
Bulletin of Environmental Contamination and Toxicology 3, No. 3, 155-163 (May-June 1968) (Springer-Verlag New York Inc., 175 Fifth Avenue, New York, N.Y. 10010)

The use of malathion in the field of pest control and the possible translocation of malathion in the environment has necessitated the development of a simple and sensitive method for determination of this substance in water and in fish. This paper describes in detail a reliable sequence of techniques for such determinations.

Recovery of malathion from fortified tissues of fish.--Trap the fish alive between two blocks of sponge covered with a plastic sheet and secured to a strong stand.

1. Blood. Take the blood by heat puncture and quickly remove the brain and other desired tissues. Immediately centrifuge the blood at high speed in a refrigerated centrifuge. Extract the malathion from fortified serum by vigorously shaking thrice one part of serum with three parts of hexane in a centrifuge tube. Either wait for phase separation or centrifuge the sample. Dry an aliquot of the hexane layer with sodium sulfate. Assay the malathion by the described gas-liquid chromatography technique.
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sodium lauryl sulfate solution, a temperature of 65° C., and a stirring time of 15 min.

The table shows fat, protein, and lysine values for FPC prepared commercially and in the laboratory under these optimum conditions from comminuted raw fish at different pH values of fat extraction. The figures are average values based on results from at least two runs at each set of conditions.

Type FPC	pH of rinse solution	Fat		Lysine		Protein (N×6.25)	
		BT*	AT**	BT*	AT**	BT*	AT**
Prepared commercially	7.0	6.5	4.6	6.5	6.5	74.0	72.0
	7.0	4.6	6.8	6.5	6.5	82.0	75.0
Prepared in laboratory	6.5	1.5	6.6	6.6	6.6	75.0	75.0
	7.0	1.5	6.3	6.3	6.3	73.0	73.0
	8.0	0.4	6.5	6.5	6.5	73.0	73.0
	9.0	0.2	6.1	6.1	6.1	69.0	69.0

*BT - before treatment

**AT - after treatment

The results show that detergents have an effective fat-removing action. The FPC prepared falls into Class B according to the FAO classification. The odor, taste, and color of the product are fairly good. No results would indicate that the treatment might lower the biological values of the product. Even concentrates prepared at high pH values have lysine and protein values that are close or equal to those specified by FAO FPC experts in 1961.

6.190

made from fish viscera with those of commercial meals. A recent study of vacuum-dried codfish viscera (Arnesen and Einarsen, 1967) substantiates the data presented here.

The four commercial fish meals examined were a Norwegian herring meal, a British white-fish meal made from offal, and two Peruvian anchovy meals, one of poor and the other of good nutritional quality. Viscera from white fish and herring were azotropically dried, and their amino-acid compositions were compared with the compositions of an azotropically dried whole herring and the four commercial fish meals.

The visceral meals were similar in composition to the whole herring meal and the commercial meals, although the herring visceral meals contained appreciable quantities of nitrogen that were not identified in the amino-acid analysis. An attempt was made to relate the nutritive value of the azotropically dried meals to their amino-acid compositions by feeding the meals to rats and chicks. The nutritive values of the meals when fed to rats as the sole source of protein were apparently related to their histidine content. In tests where the meals were fed to chicks as a supplement for a cereal-based ration, nutritive value was related to total lysine content.

The visceral meals were relatively rich in soluble nitrogen. In one of the visceral meals manufactured during warm weather, there was considerable autolysis to free amino acids. Autolysis and bacterial spoilage may lower the histidine content of visceral meals and possibly produce toxic substances. It is the opinion of the authors that, with efficient processing, fish viscera could provide protein-rich concentrates of fair quality. [28 references]

7.49

2. Brain, liver, and small gills. Macerate the samples with hexane in a tissue grinder and follow the same procedure used for blood.

3. Skin, flesh, and large gills. Blend the chopped samples with three to five parts of hexane in a stainless-steel homogenizer for 5 min. at high speed. Mechanically shake the sample in a wide mouth Erlenmeyer flask for 1 hr., then centrifuge for 15 min. at 2,000 r.p.m. Decant the hexane layer and combine the extracts. Dry an aliquot with sodium sulfate and analyze by gas chromatography.

The procedure is much simpler than the method using activated carbon, for the use of large numbers of separating funnels is eliminated, and smaller volumes of solvent for extracting are required. No cleanup of water samples is necessary; however, the cleanup techniques described for fish could be used if needed.

The Florisil column was quite efficient in removing interfering peaks from a malathion extract of carp flesh; no major interfering peaks were produced before the malathion peak. Extracts from frozen fish tissues contained less co-extractives and were less colored than extracts from fresh fish. The retention time of malathion under the conditions described in this paper was 7.2 min. and that of the lindane used as an internal standard was 3.1 min.

Teflon liners should be used for caps of the vials in which malathion extracts or solutions are stored. The author believes that this technique may have wider application in pesticide residue analysis because unwashed glass wool and various plastic films produce interfering peaks in the electron capture gas chromatograph.

7.461

Analysis of variance was made by comparing the difference in averages for halibut flesh between the coulometric and AOAC (Association of Official Analytical Chemists) methods. The variance within the samples was greater than that between samples. No significant difference was found between the two methods.

Replicate results of instrumental analyses of halibut flesh were in good agreement. Comparative replicate results obtained with the AOAC method indicated that little practical difference existed at the level of salt concentrations used. The differences ranged from undetectable to 0.1 percent, with an average of 0.02 percent. At levels of salt concentration between 0.6 and 2.0 percent, the differences between the coulometric and AOAC methods ranged from 0.04 to 0.18 percent.

Recovery data with known amounts of sodium chloride added to fish indicated close agreement. No interference in instrumental precision was noted during recovery of the added salt from crab flesh or tuna flesh packed in vegetable oil.

The fish extracts did not adversely affect the anode, so only flushing with water was done after each titration. Polishing the generator electrode after every 75 to 100 analyses ensured accurate titrations. The instruments needed no special care after use other than protecting the electrode assembly from accidental blows. About 10 min. was needed to equilibrate the instrument prior to use. Standardization and sample analysis were begun right after the warmup period.

The results from the collected data demonstrate that the Cottle Chloridometer can be used to measure the concentration of salt in fish products. Little experience is necessary to operate the instrument. It can be used easily in routine control work with a minimum of time. The advantages of speed, ease, and precision outweigh the slight differences in results found between comparative methods. In the authors' opinion, the coulometric method is considered practical for use in quality control.

Njaa, Leif Rein, Finn Utne, Olaf R. Braekkan (Government Vitamin Laboratory, Norwegian Fisheries Research Institute, Bergen, Norway)
Nature **218**, No. 5141, 571-572 (May 11, 1968)

During previous feeding experiments, the authors found that 0.5 percent of methionine in a diet containing 12 percent of cod-liver oil prevented yellow discoloration of the diet and destruction of vitamins A and E. In the present study, the authors studied the antioxidant properties of methionine and its esters with manometric and spectrophotometric techniques.

Hydrochlorides of the methyl and ethyl esters of methionine were tested in a diet consisting of 60 percent sucrose, 24 percent casein, 12 percent cod-liver oil, and 4 percent salts. The esters were added in the first two experiments in amounts equivalent to 0.5 percent of methionine; in the third experiment, methionine methyl ester was added in concentrations equivalent to 0.5, 0.1, and 0.02 percent of methionine. The lowest concentration of methyl ester added was equivalent on a molar basis to 0.03 percent butylated hydroxytoluene (BHT).

Experiment I.--Methionine, methionine sulfoxide, and methionine ethyl ester hydrochloride were tested in this experiment. Methionine retarded the uptake of oxygen for about 7-8 weeks, as compared with 2-3 weeks for both cystine and the control, α -aminobutyric acid. On the other hand, methionine sulfoxide was active (over)

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ABSTRACTER: M. F. Tripple

Burt, J. R., J. Murray, and G. D. Stroud (Torry Research Station (Ministry of Technology), 135 Abbey Road, Aberdeen, Scotland)
Journal of Food Technology **3**, No. 2, 165-170 (June 1968)

The hypoxanthine content of fish muscle is recognized as a good indicator of deterioration in many species of chill-stored fish, of precanning quality in canned herring, of prefreezing quality in frozen cod, and of quality in irradiated fish. The available methods of measuring hypoxanthine concentrations in deproteinized extracts differ in their accuracy, speed of execution, and the amount of instrumentation required. The automated enzymatic procedure of Jones et al. (1965), which uses xanthine oxidase and which monitors hypoxanthine as its oxidation product, uric acid, is reasonably rapid and accurate; however, it requires complex equipment, including a recording ultraviolet spectrophotometer. A separate blank determination also must be carried out on each extract to compensate for varying background ultraviolet absorptions at the monitoring wavelength.

This paper describes the automation of the enzymatic method of Burt et al. (1968) in which the reaction mixtures incorporate an oxidation-reduction indicator dye (2,6-dichlorophenol indophenol). The advantages of the automated method are that extract blanks do not need to be determined, a simple colorimeter may be used, and the reaction time is reduced. The dye method is more appropriate to those cases where the extracts being processed have high ultraviolet absorption.

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ABSTRACTER: M. F. Tripple

Yamagata, Makoto, Katsuya Horimoto, and Chujiro Nagaoka (Japan Frozen Foods Inspection Corporation, Sanshikaikan, Yurakucho 1-7, Chiyodaku, Tokyo, Japan)
Bulletin of the Japanese Society of Scientific Fisheries **34**, No. 4, 344-350 (April 1968) (In Japanese; summary and tables in English)

The method used by the authors to determine the amount of TMAO (trimethylamine oxide) in the muscle of frozen yellowfin tuna has two steps: (1) TMAO is reduced to TMA (trimethylamine) with titanous chloride by a method modified from that of Bystedt et al. (1959), and (2) the TMA formed is measured by the microdiffusion method of Beatty and Gibbons (1937). As a result of using this method, the authors found that:

1. The TMAO content in the muscle of green tuna is markedly higher than that of normal tuna, especially in the superficial layers of the body muscle and in the muscles near the head and the tail.

2. The red muscle and the muscles next to the fins contain high levels of TMAO whether the tuna is green or normal. The TMAO in these muscles is converted into TMA fairly soon after the fish dies.

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ABSTRACTER: L. Baldwin

Brightwell, R., and A. L. Tappel (Department of Food Science and Technology, University of California, Davis 95616)
Archives of Biochemistry and Biophysics **124**, Nos. 1-3, 325-332 (March 20, 1968)

The occurrence of lysosomal phosphodiesterases and some of the properties of these enzymes are reported. The enzyme with properties similar to those of the hog kidney enzyme is designated as alkaline phosphodiesterase I; the lysosomal enzyme acting on nitrophenyl-pF at acid pH is designated as acid phosphodiesterase I; the enzyme acting on bis-(nitrophenyl)-P is designated as phosphodiesterase IV.

The enzyme that hydrolyzes p-nitrophenyl-5'-phosphothymidine most rapidly at pH 5.2 (designated as acid phosphodiesterase I) was shown to be lysosomal in rat liver. This enzyme was differentiated from the enzyme that hydrolyzes the same substrate most rapidly at pH 9.6 (designated as alkaline phosphodiesterase I) by their subcellular distributions and properties. The lysosomal enzymes were chromatographed on diethylaminoethyl- and carboxymethylcellulose. Lysosomal acid phosphodiesterase I had a K_m value of 0.4 mM for p-nitrophenyl-5'-phosphothymidine and was not affected by Mg^{++} , Ca^{++} , ethylenediaminetetraacetate, dithiothreitol, and Triton X-100. The enzymes that hydrolyzed bis-(p-nitrophenyl)-P (designated as phosphodiesterase IV) were present in the lysosomes and cell sap

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ABSTRACTER: M. F. Tripple

LYSOSOMAL ACID PYROPHOSPHATASE AND ACID PHOSPHATASE

Brightwell, R., and A. L. Teppel (Department of Food Science and Technology, University of California, Davis 95616)
Archives of Biochemistry and Biophysics 124, Nos. 1-3, 333-343 (March 20, 1968)

The properties of lysosomal acid pyrophosphatases from rat liver and kidney and the substrate specificity of lysosomal acid phosphatase from rat liver are reported.

Acid pyrophosphatase, hydrolyzing adenosine triphosphate (ATP) and other nucleoside triphosphates, pyrophosphate (PP_i), thiamine diphosphate, and flavin adenine dinucleotide (FAD) were purified from a homogenate of rat liver and were separated from acid phosphatase by chromatography on carboxymethylcellulose. The pH optimum for hydrolysis of ATP and PP_i was between pH 5 and 5.4. The K_m values for ATP was 0.19 mM; the K_m value for PP_i was 0.07 mM. ATP was hydrolyzed to adenosine diphosphate, which was then hydrolyzed by acid phosphatase to 5'-adenosine monophosphate, and then to adenosine. The effects of various inhibitors and activators on the hydrolysis of ATP and PP_i were determined. The acid pyrophosphatase was not phosphoprotein phosphatase or any other previously reported ATPase. Lysosomal acid pyrophosphatase, which hydrolyzed ATP and PP_i, was also prepared from the homogenate of rat kidney and further purified by chromatography on Sephadex G-200. The K_m for ATP hydrolysis was 0.24 mM. Lysosomal acid pyrophosphatase was most active at pH 5.2-5.4. The effects of other activators and

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ABSTRACTER: M. F. Tripple

SKIPPERS MUST HAVE FISHING CHARTS

Thomson, David B. (Department of Fisheries and Marine Technology, University of Rhode Island, Kingston, Rhode Island)
Canadian Fisherman 55, No. 7, 24-25, 29 (July 1968)

The author believes that proper fishing charts are essential if the fishing fleets are to achieve their full potential and compete effectively with foreign vessels. The introduction of fishing charts would be of immediate benefit to the industry and would stimulate cooperation and correlation of information, which could make a national fish-forecasting system a definite possibility. Proper fishing charts would be particularly advantageous for skippers without a background of experience to draw upon. The need for two particular items to help the fishing skipper is apparent. The skipper requires detailed, large-scale charts of the fishing grounds where he operates, and he requires a positioning system that is both accurate and simple to operate. These two requirements are met in fishing charts based upon the best system available.

The generally accepted system in Europe for inshore fishermen is the Decca Navigator system, which meets the requirements of accuracy, simplicity, dependability, and cheapness. The accuracy required by European fishermen require accuracy to within 50 feet; this is usually possible with the equipment. The charts are latticed with the respective position lines, and all fixes can be referred to these lines. The fishing chart contains detailed information on the

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ABSTRACTER: M. F. Tripple

LYSOSOMAL ACID PYROPHOSPHATASE AND ACID PHOSPHATASE

CHARTS FOR FISHERMEN

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Philips, Richard H.
National Fisherman 49, No. 5, 22B-23B (August 1968)

A Japanese scientist, Dr. Motoo Inoue, has proposed a method for farming tuna. His proposal is outlined in a paper titled "Planning for Increased Tuna Production in the Pacific."

In his article, Dr. Inoue tells of experiments performed aboard a vessel, where it was possible to hatch tuna eggs within 21 hours. The survival rate for these eggs, under large-scale hatchery conditions, was estimated at 80 percent, or the same rate as for salmon. Because the adult yellowfin can produce 5 million eggs, only 30 adult tuna could theoretically produce 120,000,000 fry.

Fry mortality now hinges upon the availability of food and upon changes in the sea that force the young fish into unfavorable areas. If lagoons and atolls were transformed into hatching ponds, the death rate in the tuna fry would drop. The tuna fry while contained in the seminaturnal hatching ponds would be protected from predators and would be adequately fed. Dr. Inoue would solve the food problem with a newly developed marine chlorella. This green seaweed, which is 50 percent protein by dried weight, can be fed to the small animals and plankton that will subsequently feed the young tuna. Also, fine mesh trawls could be used to collect food for the fry.

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ABSTRACTER: S. G. Cordell

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Anonymous
World Fishing 17, No. 5, 36-37 (May 1968)

TROUT FARMS MAKE GREAT CONTRIBUTION TO ECONOMY

The Danish trout-farming industry makes a considerable contribution to the Danish economy. There are over 250 exporters handling trout in Denmark, and 500 trout farms produce over 7,500 tons of fish a year, valued at 62 million kroner. Production of trout in Denmark has risen by one-third, from 5,800 tons in 1963 to 7,600 tons in 1966. About 10 percent of the fish are exported live, about one-third are exported frozen, and the remainder are shipped iced. There is also a trade for live trout eggs used for restocking sport fisheries and establishing and enlarging trout farms overseas.

The two species commonly cultivated are the rainbow trout and the brown trout, although the rainbow trout is more suitable for artificial rearing because it is less susceptible to temperature variations and, in its early stages, can withstand higher water temperatures than the brown trout can. The brood trout are selected early in the year for the extraction of eggs and milt for fertilization. When sufficient fish are ready for stripping, they are netted and confined for the stripping operation. Care is taken to leave the fish alive for future stripping. The brood fish are retained in special raceways until sufficient fish are in season. Stripping takes place at intervals of between a week and a fortnight. The stripping operation occurs in the shade because the eggs are

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ABSTRACTER: M. F. Tripple

TUNA FARMS IN THE PACIFIC

DANISH TROUT FARMS

damaged by bright light. The eggs are kept dry because it has been found that the fertilization rate with dry eggs can be as high as 98 percent, whereas eggs in water may have a rate as low as 50 percent. When sufficient eggs have been collected in a sieve, the sieve is emptied into a bowl and a male trout is stripped of its milt onto the eggs. The eggs are stirred by hand and are then left in the shade while another batch of female trout are stripped into the sieve. The eggs in the bowl are washed to remove the milt because it is essential that the fertilized eggs be as clean as possible. The eggs are put in the darkened hatchery until they hatch, in 4 to 6 weeks. When the eyed stage is reached--that is, when the embryo fish is almost fully developed--the eggs may be transported for seeding. Dead eggs are discarded.

0.34 (*)	QUANTITATIVE DETERMINATION OF ALK-1-ENYL- AND ALKYL-GLYCERYL ETHERS IN NEUTRAL LIPIDS AND PHOSPHOLIPIDS Wood, Randall, and Fred Snyder (Medical Division, Lipid Research Laboratory, Oak Ridge Associated Universities, Inc., Oak Ridge, Tennessee 37830) Lipids 3, No. 2, 129-135 (March 1968)	A quantitative method for simultaneously determining alk-1-enyl-glycerol ethers and alkyl-glycerol ethers is described. Carboxylate and phosphate esters of neutral lipids and phospholipids are completely hydrogenolyzed with lithium aluminum hydride. Alk-1-enyl-glycerol ethers, alkyl-glycerol ethers, and alcohols will be the hydrogenolysis products of the lipids that contain glycerol ether. These products are identified by thin-layer chromatography (TLC), gas-liquid chromatography (GLC), and infrared spectroscopy; the ethers are quantitated by TLC photodensitometry. The specificity of the method makes it useful in conjunction with GLC, ion-complexing TLC, zonal scanning, and autoradiography to study composition, isomeric form, and biosynthesis of glycerol ethers in both neutral lipids and phospholipids. In the neutral lipids and phospholipids of rat tissues analyzed by the method, glycerol ether glycerides represented 0.3-1.2 percent of the total neutral lipids; glycerol ether phosphatides of brain, heart, marrow, muscle, and spleen represented 4.5-12.0 percent of the total phospholipids. The neutral lipids contained higher concentrations of glycerol alkyl than of alk-1-enyl ethers; the phospholipids had higher concentrations of glycerol alk-1-enyl ethers. [44 references] *Items on back of card. COMMERCIAL FISHERIES ABSTRACTS VOL 22 NO 1 PAGE 21 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE
1.4 (*)	SEBASTODES REEDI, A NEW SCORPAENID FISH IN THE NORTHEAST PACIFIC OCEAN Westrheim, S. J., and H. Tsuyuki (Fisheries Research Board of Canada Biological Station, Nanaimo, British Columbia) Journal of the Fisheries Research Board of Canada 24, No. 9, 1945-1954 (September 1967)	A new scorpaenid species, named <i>Sebastes reedi</i> (yellowmouth rockfish), is described using both conventional and biochemical methods such as starch-gel electrophoresis of proteins from hemoglobins and muscle. <i>S. reedi</i> resembles <i>S. alutus</i> , <i>S. cramerii</i> , and <i>S. proriger</i> , but it can be readily separated from these species morphologically and biochemically. <i>S. reedi</i> differs from all the other <i>Sebastes</i> species in having yellow and black blotches in the mouth; it differs from the individual species in respect to the number of scales, gill rakers, and spines, and in electrophoretic patterns. <i>S. reedi</i> appears to exist in two variant forms as determined by hemoglobin electrophoretograms, although no corresponding morphometric or meristic differences have been detected. The present geographical range of this species extends from Cape Blanco, Oregon, to Sitka, Alaska, and the bathymetric range is from 77 to 200 fathoms. Substantial aggregations of this species have been discovered in three areas off British Columbia; however, all the aggregations were virtually unfishable with conventional groundfish trawls. Otolith readings suggest an age range of 5 to 34 years for specimens 25 to 53 centimeters in length. No mature fish were less than 31 to 33 cm. long or less than 9 years old. [12 references] *Item on back of card. [Abstracter: M. F. Tripple] COMMERCIAL FISHERIES ABSTRACTS VOL 22 NO 2 PAGE 21 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE
2.110 (*)	A QUICK REFERENCE TO FISHING VESSELS AND THEIR GEAR Anonymous A Guide to Fishing Boats and Their Gear by Carvel Blair and Willits Ansel (Cornell Maritime Press, Cambridge, Maryland) n.d. Price \$5.00 Fishing News International 7, No. 7, 94 (July 1968)	This book is recommended to persons professionally engaged in the fishing industry, as well as to the ordinary reader. While Captain Blair was in England, he became interested in the number and variety of fishing craft seen in the ports and along the coast. He then found there was no comprehensive explanation of fishing equipment, nor was there a recognition guide to fishing vessels. The volume attempts, on a modest basis, to do for the world's fishing boats what others have done for the identification of naval vessels. Centuries of experience have taught that every ship that floats and every piece of her gear must have a name. It behooves the professional seaman to learn the names of the fishing boats with which he shares the sea. The book is clearly written, well illustrated, and has a methodical sequence of chapters, which start with an outline of fishing methods, gear, and the fish involved. Subsequent chapters cover trawlers, hook-and-line craft, gill netters, purse seiners, harpooners, support ships, and research vessels. There is even a chapter on small boats. The book concludes with a glossary, a bibliography of fishing books and trade magazines, and an index. *Item on back of card. [Abstracter: M. F. Tripple] COMMERCIAL FISHERIES ABSTRACTS VOL 22 NO 1 PAGE 21 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE
0.5 (*)	A PROTEOLYTIC PSEUDOMONAD FROM SKIN LESIONS OF RAINBOW TROUT (SALMO GAIRDNERII). I - CHARACTERISTICS OF THE PATHOGENIC EFFECTS AND THE EXTRACELLULAR PROTEINASE Li, M. F., and Carol Fleming (Fisheries Research Board of Canada Halifax Laboratory, Halifax, Nova Scotia) Canadian Journal of Microbiology 13, pp. 405-416 (1967)	A fluorescent pseudomonad that produced a powerful extracellular proteinase and closely resembled, but was not identical with, <i>Pseudomonas fluorescens</i> was isolated from skin lesions of rainbow trout. Subcutaneous injection of the live organism into healthy frogs caused a condition similar to redleg disease and finally caused death. Subcutaneous injection of the organism into healthy rainbow trout caused the formation of large, necrotic, swollen areas filled with fluid. Histologic examination of the infected animals showed a high degree of destruction of the muscular tissue in the affected areas. The pathogenic effect was apparently due to the extracellular bacterial proteinase. Growth of the pseudomonad was insignificant between 15° and 25° C. Culture filtrates possessed strong proteolytic activity against casein, hemoglobin, and albumin of rainbow trout muscle. Production of the proteinase was dependent upon the growth of the organism and the composition of the growth medium. [32 references] [Abstracter: M. F. Tripple] *Items on back of card. COMMERCIAL FISHERIES ABSTRACTS VOL 22 NO 1 PAGE 21 UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE

<p>2.1124</p>	<p>0.5</p>	<p>CATCHING EFFICIENCY OF MASU-AMI WITH DIFFERENT COLORED BAG-NETS. I - THE EFFECT OF COLORED BAG-NETS ON CATCH</p> <p>Koike, Atsushi (Tokyo Univ. Fish., Minato-ku, Tokyo, Japan) Bulletin of the Japanese Society of Scientific Fisheries 34, No. 3, 177-184 (March 1968)</p> <p>The "masu-ami" is a small trap net that is very popular among Japanese fishermen. It has three parts: (1) a lead net, which opens into (2) a fence net, and (3) three or more bag nets, which are attached to the corners or the sides of the fence net. The catching efficiency of different colored bag nets was studied and is reported here.</p> <p>The bag nets used in the studies were either red, yellow, blue, green, or a natural light brown. All were made of saran twine. The position of the bags on the fence was changed every 10 or 15 sets.</p> <p>Fishes that seemed to be attracted by the colored bags were sea bass (<i>Lateolabrax japonicus</i>), black porgy (<i>Sparus awohoniensis</i>), flat fishes, conger eel (<i>Lumpenus anguillaris</i>), rock trout (<i>Hexagrammos octogrammus</i>), and squid (<i>Sepiella maendroni</i>). Fishes that seemed to be unaffected by the color of the bags were gray rock cod (<i>Sebastes inermis</i>), surf perch (<i>Ditrema temminckii</i>), prawn (<i>Penaeus japonicus</i>), and blue crab (<i>Neptunus trituber</i>). Although gray rock cod and surf perch tended to enter the bags during the day, they seemed to pay no attention to colors; yet squid, flat fishes, and black porgy, which tended to enter the bags between dusk and dawn, seemed to select the colored nets. The catches seemed to be influenced not only by the difference of light intensity of the bags but also by such other light factors as spectral distribution within the bags. [10 references]</p> <p>[Abstract: L. Baldwin]</p>	<p>0.5</p> <p>TAXONOMY OF PSYCHROPHILIC STRAINS OF <i>BACILLUS</i></p> <p>Larkin, J. M., and J. L. Stokes (Department of Bacteriology and Public Health, Washington State University, Pullman) Journal of Bacteriology 94, No. 4, 889-895 (October 1967)</p> <p>The morphological and physiological characteristics of 20 isolates of psychrophilic strains of <i>Bacillus</i> were compared with 29 strains representing 9 species of mesophilic <i>Bacillus</i> and 2 strains of <i>Sporosarcina ureae</i>. The purpose of the comparison was to determine the taxonomic position of the psychrophilic strains. The psychrophilic strains formed four distinct groups that were sufficiently different from the mesophilic to warrant the designation of the psychrophilic strains as new species of <i>Bacillus</i>. The names <i>B. psychrosaccharolyticus</i>, <i>B. insolitus</i>, <i>B. globosporus</i>, and <i>B. psychrophilus</i> are proposed by the authors as names for the new species. [12 references]</p> <p>[Abstract: M. F. Triple]</p> <p>-----</p> <p>as yet unknown. [18 references]</p> <p>[Abstract: M. M. Gwin]</p> <p>-----</p> <p>The spores of <i>Clostridium</i> species N1 have numerous broad ribbonlike appendages attached to one end. These appendages are two to three times longer than the spore and possibly two-thirds the width of the spore at their maximum dimension. All the appendages are attached to the outer spore coat. Each appendage is a multilayered structure enclosed in an amorphous material. Details of spore and appendage formation and appendage ultrastructural features are described. The function of the appendages is as yet unknown. [18 references]</p> <p>[Abstract: M. M. Gwin]</p> <p>-----</p> <p>RODE, L. J., MARGARET A. CRAWFORD, and M. GLENN WILLIAMS (Department of Microbiology and Electron Microscope Laboratory, The University of Texas, Austin) Journal of Bacteriology 92, No. 3, 1160-1173 (March 1967)</p>	<p>1.85</p> <p>DYBHAVSREJEN (<i>PANDALUS BOREALIS</i>) BIOLOGI - FISKERI - RAVAREBEHANDLING - TILVIRKNING [THE DEEP-SEA SHRIMP (<i>PANDALUS BOREALIS</i>) BIOLOGY - FISHERY - UTILIZATION]</p> <p>Fiskeriministeriets Forsøgslaboratorium, 109 pp. (1968) (Copenhagen, Denmark) (In Danish; summaries in English)</p> <p>Of the 10 sections in this 1968 report issued by the Fisheries Ministry's Research Laboratory, Copenhagen, 9 have English summaries. They and their authors are: The Deep-Sea Shrimp: Occurrence, Biology, Fishery - Erik Smidt. Live and Fresh Raw Materials. Chilled Storage - Poul Hansen. Frozen Raw Material. Freezing, Storage, Thawing - Jørn Aagaard. Cooking and Peeling - Poul Hansen. Machine Peeling - Villy Andersen. Pasteurization of Shrimps Before Freezing - Bjørn Fredebo Thomsen. Freeze-Drying of Shrimp - J. Lorentzen. Frozen Shrimp as an End-Product - Jørn Aagaard. Canned Shrimp - Poul Hansen.</p> <p>The tenth section concerns statutory regulations governing the industrial processing of shrimp.</p> <p>Also included are 2 graphs, 4 charts, 23 photographs, and 10 line drawings--all with English subtitles--and 22 tables without English subtitles. [Abstract: L. Baldwin]</p>	<p>0.38</p> <p>ACTIVATION OF α-CHYMOTRYPSINOGEN WITH A TRYPSIN-LIKE ENZYME FROM THE PYLOTIC CECUM OF THE SALMON, <i>ONCORHYNCHUS KETA</i>. I - THE ACTIVATION REACTION</p> <p>Ushiyama, Hiroshi, Takeshi Shibata, Katsuj1 Yoshimura (Hokkaido Univ., Hakodate, Japan) Chemical Abstracts 69, No. 5, 16391p (July 29, 1968)</p> <p>0.39</p> <p>THE COMPARATIVE BIOCHEMISTRY OF COLLAGEN</p> <p>Pikkariinen, J., J. Rantanen, and E. Kulonen (Univ. Turku, Finland) Chemical Abstracts 68, No. 3, 9295m (January 15, 1968)</p> <p>[Abstract: S. G. G. Cordell]</p> <p>Some meat ingredients retain moisture well, whereas others retain it poorly. To calculate formulas for emulsified sausage products that satisfy consumer demands for emulsified sausage products must be able to determine the effects of combining various types of meat. In this report, the authors discuss the effects of fat, freezing, postmortem age, centrifugation speed, cooking procedure, and water-holding capacity on the water-holding capacity of beef and pork products.</p>	<p>FISHING GEAR SHRIMP</p>	<p>AND BIOCHEMISTRY AND TRYPSIN-LIKE ENZYME</p>
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III - EFFECT OF STORAGE TEMPERATURE ON DISCOLORATION OF TUNA MEAT DURING FREEZING STORAGE

Bito, Masamichi (Tokai Regional Fisheries Res. Lab., Tokyo, Japan)
Chemical Abstracts 66, No. 23, 104068g (June 5, 1967)

III - The discoloration of tuna meat during storage at the freezing point.
Ibid. 104069h.

THE PIGMENTS OF FISH EGGS.

Fukumi, Toru, and Masayoshi Nakamura (Hokkaido Cent. Fish. Exp. Sta., Yoichi, Japan)
Chemical Abstracts 69, No.9, 34751k
(August 26, 1968)

3.2493 EFFECTS OF ANTE- AND POSTNORMEM FACTORS ON THE DEGRADATION OF 5' NUCLEOTIDES DURING ICE STORAGE OF TWO MARINE SPECIES

Chemical Abstracts 65, 19219g (December 5, 1966)

CHANGES IN B-GROUP VITAMINS OF DRIED FISH ON STORAGE AT ROOM TEMPERATURE

IMPROVED CONTROL OF MOISTURE WITHOUT VISCOSITY ALTERATION

Food Product Development 2, No. 2, 98 (April-May 1968)

A unique, pregelatinized, tapioca starch is said to effectively control moisture without adversely affecting viscosity. It is bland and readily dispersible in liquids, and it improves texture and gloss without causing a "gummy" effect in the mouth. It is said to be exceptionally good for use in fish loaves, meatballs, and similar fat-protein emulsions where retention of moisture is required despite the most severe forms of cooking.

[Abstracter: L. Baldwin]

Products containing the starch fit under the labeling requirements set forth in Federal regulations for comparable starch-modified foods.

Chemical Abstracts 67, No. 9, 42677q (August 28, 1967)

VI - ELECTRON MICROSCOPIC OBSERVATIONS ON JELLING (SUWARI,
AND LIQUEFACTION (MODORI) IN THE PROCESSING
OF FISH MEAT JELLIES

CHEMICAL ABSTRACTS 66, No. 9, 36629P (February 27, 1967)

IRRADIATION PRESERVATION

STORAGE OF FROZEN FISH

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